SCIENTIFIC AMERICAN

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IMPROVED COTTON PICKER.

Cotton picking, as our readers are well aware, is now almost universally done by hand, and, as a matter of course, is a slow, tedious, and expensive operation. A machine which would successfully take the place of hand picking has long been needed, but there have been so many difficulties lying in the way of its construction and perfect operation, the work required of it has been of such a delicate and exacting nature, as to make it, of necessity, a most accurate piece of mechanism. The perfect machine should remove all the fiber from every pod, should leave the plants uninjured, should require a minimum amount of care and attendance, and should be rapid in operation.

The cotton harvester illustrated upon this page is mounted upon wheels which stride the cotton row, and is designed to gather the cotton from the growing plants with the least possible damage to them, and to automatically deliver the cotton into a receptacle carried on the machine.

The machine is double, there being a right and left portion, each forming a complete self-operating machine, and the two being connected together by the top yoke portion of the frame, so as to run astride the row, each part of the machine reaching in among the branches on its side of the row to pick the seed cotton. This is accomplished by a series of gibbous-shaped plates mounted on a pair of longitudinal shafts journaled in the frame and revolved by the main driving wheels acting through suitable beveled gears; the picker shafts make about five revolutions to one revolution of the driving wheels. The plates are bounded by two convex arcs of a circle, and are rounded at the ends to enable them to part their way among the cotton branches while revolving, and to permit them to crowd any limbs which may chance to lie across the apertures in which they rotate up out of their path. Each of the plates is perforated near one edge to receive the shaft upon which they are fixed to project alternately on opposite sides to balance each other; their motion is across the path of the machine and upward through the cotton. The front face of each plate is armed with a great many picking teeth set like card teeth to hook in the direction of their motion to pick the cotton. By the revolution of the plates or pickers the cotton is carried through the apertures in the wall of the brush box, and is there stripped from the pickers by rapidly revolving vertical brushes. The cotton thus accumulates in the brush box against the foot of a revolving toothed apron, by which it is carried up and thrown into a removable receptacle, where it remains until unloaded by hand. The brushes and apron are revolved by suitable trains of gears connected with the main driving wheels.

The forward end of the machine is supported upon two caster wheels, in front of which are placed sheet iron guards to turn the limbs of the plants out of their paths, the guards converging toward the passage between the two portions of the machine to bring the cotton to the pickers. When the machine is provided with more than one pair of pickers, the second pair is placed above the first so as to adapt the machine to cotton of any height; the plates of the lower pair are intended to approach within about four inches of each other. The plates of the upper pair are intended to touch a central vertical plane, in order that they may reach entirely across through the row of plants. The picker plates of the upper pair in each instance pass between the plates of the next lower pair, to a distance of about four inches, to prevent the branches being drawn in among them.

The tongue of the machine is attached to the frame at the center of the forward crossbar, and extends forward over the tops of the plants and carries a yoke above the necks of the team. The traces are secured to single trees attached to a double tree pivoted to the frame, and which bends down to the proper level for attaching the team. The receptacle is made of wire cloth supported on a frame, to allow sand and dirt to be jarred out of the picked cotton.

The principal point in this machine consists in the use of the gibbous plates, the teeth of which being thickly set—card-like—on the front side at an angle of 30 degrees, and protected on the outer edge by a rim exactly abutting with the plane of the teeth, which are perfectly true, prevents the possibility of the teeth taking anything but lint; a leaf, or limb, or even the hand, will pass freely over the surface of the teeth. The two tiers of plates extend up about five feet, and if desirable to reach higher, other tiers can be added. As the machine passes over the row, the picker plates come in contact with every one-half inch of the entire plants, from top to bottom, and gather every boll of

IMPROVED MECHANICAL COTTON PICKER.

open cotton, which is delivered to the receptacle absolutely free from dirt of every description. The capacity of the machine is measured by the number of acres it can be drawn over in a given time and the amount of open cotton it encounters. For instance, if there were half a bale to the acre, and it were drawn over eight acres a day, this would not be an excessive load for two horses. As the machine weighs about 800 pounds, it would pick out four bales per day, thus doing the work of sixty hands. At this rate this machine could gather cotton at a cost of less than one dollar per bale.

This machine, as will readily be perceived, is simple in construction, the parts are few and not liable to derangement, and it removes the cotton, whether from high or low plants, efficiently and rapidly, and leaves the plants in as uninjured a condition as possible.

Additional particulars regarding this cotton picker can be obtained by addressing the inventor, Mr. R. K. Charles, of Darlington, South Carolina.

The Temple of Baalbec.

Rev. Henry M. Field, D.D., after his return from an extended tour through Eastern countries, has published a book on India and the Holy Land which is both instructive and entertaining. Doctor Field, in a letter to the *Evangelist*, of which he is the editor, thus describes the ruins that mark the place where the grandest of ancient cities is believed to have existed:

The ruins of the ancient city of Baalbec, situated on the plain forty-three miles northwest of Damascus, are the wonder of modern architects.

Everything is colossal. The area is larger than that of the temple at Jerusalem. We may begin with the walls, which are half a mile around, and of such height and depth as are rarely attained in the most tremendous fortress. Where from within I climbed to the top, it made me giddy to look over the perilous edge to the depth below; and when from without the walls I looked up at them, they rose high in the air. Some of the stones seem as if they had been reared in place, not by Titans, but by the gods. There are nine stones 30 feet long and 10 feet thick, which is larger than the foundation stones of the temple at Jerusalem, dating from the time of Solomon, or any blocks in the great Pyramid.

But even these are pygmies compared with the three giants of the western wall, 62 feet, 63½ feet, 64 feet long. These are said to be the largest stones ever used in any construction. They weigh hundreds of tons, and instead of being merely hewn out of a quarry which might have been on the site, and left to lie where they were before, they have been lifted 19 feet from the ground, and there embedded in the wall. Never was there such cyclopean architecture. How such masses could have been moved is a problem with modern engineers.

Sir Charles Wilson, whom I met in Jerusalem, is at this moment in Baalbec. Standing in the grounds of the temple, he tells me that in the British Museum there is an ancient tablet which reveals the way such stones were moved. The mechanics were very simple; rollers were put under them, and they were drawn up inclined planes by sheer human muscle—the united strength of great numbers of men. In the rude design on the tablet the whole scene is pictured to the eye.

There are battalions of men, hundreds to a single roller, with the taskmasters standing over them, lash in hand, which was freely applied to make them pull together, and the king sitting on high to give the signal for this putting forth of human strength *en masse* as if an army were moving to battle. A battle it was in the waste of human life it caused. These temples of Baalbec must have been a whole generation in building, and have consumed the population of a province and the wealth of an empire.

How Disease is Spread.

Every one knows that scarlet fever is infectious, but it is not often one is able to trace the progress of the disease through simple carelessness so easily as in a case which has just come under the notice of the *Sanitary World*. The story is told as follows: A young Scottish lassie, in domestic service not far from the town of Elgin, died from scarlet fever in her "place." Her clothes were carefully packed up, and her "kist" containing them was conscientiously sent home to her native village. On its arrival at the station there was the usual difficulty of getting it conveyed over the hills to the place of its destination, so there it had to remain awaiting a friendly lift. Meanwhile the infected kist formed a happy hunting ground for the station master's children, who, in due time, all fell ill with scarlet fever. At last the friendly lift came, and the box (a large wooden one) was carried home, and the contents generously distributed among the neighbors. Needless to say that an outbreak of scarlet fever in the village was the result; and as to the station, where people do congregate and often have long to wait, it would simply be a center from which many a fever track would radiate, exciting the usual wonder whence and how the fever came.

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No. 488,

For the Week Ending May 9, 1885.

Price 10 cents. For sale by all newsdealers.

SQUARE COTTER PINS.

Split pins, or "cotter pins," although not strictly and rigidly mechanical, are useful in many places. They are usually made of half round wire or rod, and doubled together, the flat faces meeting so as to form a cylindrical cross section; and while the two ends are left slightly apart "for spring," the doubled middle that forms the upper or handle end is made into a loop that gives a head and imparts a slight elasticity to the blades. For securing intermediate gears on stationary studs and for similar purposes, where the secured piece may be removed and replaced at pleasure, the cotter pin is very handy. Its philosophy is simply that the compressed halves will pass freely through the drilled hole, but that, when the compression of fingers, or tongs, or pliers is removed, the released halves will be forced against the sides of the hole, preventing removal or relaxation of tension by jarring.

Some machinists are like amateur gardeners, always trying some new plan. So, one has determined that a square cotter pin is better than a round one. He takes flat steel with a thickness as to diameter as one is to two, measures the desired length of shanks, and then forges the center of the piece to a thin blade like that of a pair of spring calipers, which he brings to a spring temper. When uncompressed, the blades or shanks stand wide apart; when compressed, they are passed through a round hole in the stud, and the force of the tempered spring end pushes them against the walls of the hole. The corners of the pin effectually prevent it from turning in the hole by the jar of the machinery in motion, and the elasticity of the spring head holds the jaws or blades out securely against the sides of the hole. The rigidity of the unforged steel makes its own seat by its corners, and the pin may be always put back into place. This prevention of turning in the hole appears to be an advantage.

SPRING GAUGES.

In these times of absolute measurements, exact estimates, and precision tools, it is time for spring gauges to give place to those of absolute movement. There is no spring calipers nor spring dividers that are absolute in both movements; one is a compression and the other a release, but only the compression is absolute, and that only to a limited degree. Our ordinary measurers of diameter should be governed by a screw or some other mechanical device that shall control the movement of the measuring points, whether they be "to or from." It is time that this old-fashioned, inaccurate system of measurement was given an indefinite recess. Exact mechanics and their productions have had enough of its "guess and try again" plan.

The spreading of the legs of a pair of spring dividers and the reach of the jaws of a pair of spring calipers depend wholly on the latent tension of the spring at the head of the instrument. This is a flat steel spring, between the legs or jaws, and is usually of a curvature representing nearly a circle. In not a single instance out of twenty-two tests has it been found that the almost circular curvature of the spring head has been of the slightest use. It appears that this form of end spring to caliper and divider is mainly a mechanical tradition, and that, in use, the curve was of no value; all the spring was close to the apex, just as in the main spring of a gunlock all the spring is in the U bend at the apex of the two arms of the spring. It follows, then, that the curve of the head of spring calipers and dividers might as well be made of the V form as of the circular form; it is certain that with this form they would be more active on demand.

But all this spring business should be taken out of our modern, exact, absolute mechanical work. If it is necessary to have temporarily adjustable gauges (which is doubtful), let them be made on the plan of the screw, which gives and takes exactly the same. Such adjustable measuring machines have been made, and readily usable hand appliances are not impossible.

CUT NAILS AND WIRE NAILS.

When a sliver is cut off the end of a section of thin iron plate, and is formed into a nail by upsetting the larger end for a head, no change in the quality of the iron takes place by the cutting and the upsetting; the fiber is the same, and the material remains of the same strength. If a piece of plate iron is cold short when in a flat plate of one or more inches area, it will not become strong, tough, and fibrous when divided into narrow widths. And yet this is the amount of the claim some cut nail makers make for their goods.

There can be—there is—no question about the economic value of cut nails; their introduction has been of the greatest service possible to all who use nails. But there is a point where their usefulness is superseded by better nails. Cut nails, like pegs, hold together superincumbent substances, but they do not, like rivets, resist transverse strains. If a nail holds the same amount of resistance to blows, the same quality of directing by blows, the same utility of double usage after being bent and crooked, as a rivet does, it is a good nail. Was there ever a cut nail that fulfilled these conditions? Never. But a wire nail does—all of them. On all its sides its fibers are compacted, and in one direc-

tion; its surface is smooth; it does not split; if it is drawn, it is again useful; if it is crooked, it may be straightened and used again. All the conditions and requirements of nails seem to be met by the wire nail; or if not met just now, there is room for improvement. There can be no improvement on the cut nail, except that of original excellence of material; all cut nails are simply cut slices from a presented sheet; on two sides at least there can be no compacting of the material, and they are left ragged. The wire nail, on the contrary, has a clean, longitudinally fibrous surface on all sides.

There may be cut nails—there are cut nails—that will stand a half twist about their own diameter; that will stand driving through hard seasoned wood; that will clinch on the other side, bending like lead. But these nails are made from Dannemora or other very tough, fibrous iron, and are costly as compared with the ordinary cut nails of the builder's use. These nails should no more be compared with the ordinary cut nails than should the boat builder's cast nails of Muntz metal; the materials are very different. It may be that some establishments, managed by practical mechanics and engineered by men with consciences, make reliable, tough, and really valuable cut nails. If there are any such, to them the article on the subject published in our issue of March 28 does not particularly apply; and possibly our readers, especially the wood workers, would be glad to hear from them in our advertising columns.

DIRT, DISEASE AND DISINFECTION.*

BY E. DWIGHT KENDALL.

"This water I purify; this earth I purify; how shall I purify the dwelling? . . . Combat uncleanness, the direct and the indirect."—*The Avesta* (*Vendidad*).

Long before that eventful dawn when Darius bestrode the historic steed and was uplifted to the throne of Persia, by *ascent* so extraordinary,† Zarathustra taught the Iranians to avoid bad smells: that those haters of mankind, "the Dævas, who slay a countless number, find joy in all to which stench clings, where are together dissolution, sickness, fever, uncleanness, cold fever, shivering." That antique medicine-man, high priest and prophet instituted laws that forbade accumulations of putrescible and noisome matters, allowed free operation of Nature's scavengers and protected wells and water courses from contamination. After all the centuries and the warning visitations of many filth-engendered epidemics, the people of every land, still heedless of the dangers that accompany impurity, need constant admonition and enforcement of sanitary laws. The ancients excelled in appreciation of the benefits of cleanliness and dislike to dirt: we may profit by their teachings; they recognized in filth the source of national plagues and opposed uncleanness in every form. "The pestilence walketh in darkness," said the psalmist, but the Jewish priests maintained a system of scavenage, themselves supervised the cleansing of cities and habitations, adopted methods of quarantining and, like other nations of the East, made personal ablution a part of religious duty.

During the centuries when ignorance prevailed and sanative regulations were unknown, successive waves of filth-disease swept over continents and unpeopled realms. Then epidemics were ascribed to sorcery, invisible fiends, the evil eye; to poisoned wells and food; to astral influence and telluric agencies, as when the earth emits, from cavern and volcano, poisonous fumes. Our good forefathers spoke of "visitations of Providence" (the sin of a people visited on other nations!) and depended more on prayer than purification. Not many years ago, the hypothesis of catalytic action was applied to explain the propagation of zymotic disease and other theories were favorably regarded by physicians. Now the morbific function of filth is shown to be a part of the natural economy and scientists say: "specific micro-organisms, septic and pathogenic bacteria: micrococci, bacilli, spirilla; behold them!" The mountain of Ages brings forth the microbes.

We are apt to adopt new conceits and often we are led astray by unfounded hypotheses, but even the luminary of the Middle Kingdom, the great opponent of innovation, who taught that truth lay in most ancient fountains of wisdom, could not have doubted the evidence that demonstrates the germ theory of disease. Science now shows that man is originated, developed and conserved by myriads of vitalized organisms, that work together in harmony and live in accord with cleanliness; that various forms of antagonistic organisms breed and dwell in filth, and when these invade the cleanly microcosm, they devastate and destroy. One foul procreant germ, conveyed into the human body by impure water, tainted food or polluted air, may generate a pestilent swarm. The disorders thus produced, mostly preventable, are classed as filth-diseases. The specific germs of many such diseases are identified: the bacilli of septicæmia, leprosy, enteric (typhoid) fever, dysentery and tuberculosis;‡ the micrococci of small pox, croupous pneumonia, scarlatina* and diphtheria, and many more.

Whether India's contribution to the plagues of mankind, the virulent septic cholera, is due to the presence of self-propagating organisms or to toxic chemical action, its source and sustenance is excrementitious filth. In the delta of the Ganges, a low and marshy tract, rendered pestiferous by continual heat and moisture, the cholera is endemic: there it has a permanent home; it is nourished by the unspeakable foulness that surrounds the huts of low caste Hindus, a despised and tabooed class, who unconsciously avenge their poverty and degradation, by sending forth this curse among the nations. It follows the paths of commerce, and where filth is, there it finds an abiding place; "in whatsoeuer contrie lyke cause and matter is, there commyng like aier and cause efficient wil make lyke effecte and disease . . . it cometh by infection and putrefaction . . . as nigh to dwelling places, merishe and muddy groundes, puddles or donghilles, sinkes or canales, easing places or carions, deadde ditches or rotten groundes, close aier in houses or uallies, with such lyke."

We must exterminate the enemy Filth, that invites the pestilence, after rendering the hydra-headed monster innocuous: we must improve the plan of Hercules and before decapitating, cauterize, attacking first with disinfectants, while we exclaim, with the Brahmins, in words from the oldest of books, "Whether thou, O greatest killer of Vritra, art in the light of heaven, or in the basin of the sea, or in the place of the earth, or in the sky . . . I turn the poison out from thee." In this work, as in therapeutics, chemistry is the ally of the noble profession—honored through all ages—which in every time of pestilence is prolific of heroes entitled to the civic crown. Hippocrates II., greatest of the Asclepiadæ, adopted means of disinfection devised by famed Empedocles, whom chemists claim, and fought a plague, successfully, with fire. Chemical science determines the nature and potency of disinfectants hitherto employed, and presents new agents with peculiar power to extirpate foul broods of parasitic microzymes. Many of the old preventives merely masked bad odor, leaving intact the contagium; others are really efficient, in themselves or by agents which they convey: thus when we wish to fumigate large spaces, we may imitate Odysseus, who purified his halls with burning sulphur and the smoke from wood. The sulphurous acid operates in three ways to destroy organic life and the smudge from green and resinous wood contains acetic acid, certain hydrocarbons, phenols, cresols, xylenols, and acrolein, all having antiseptic qualities, with power to kill bacteria and cleanse all fomites.

No disinfectant, old or new, is adapted to all circumstances: in one place suitable solids, slowly dissolving, will suffice, as quicklime, alums, tannins, salts of lead, zinc, copper and iron; in another we must use a miscible liquid, like solutions of salts and alkalies, acids and phenols; elsewhere nothing will reach the evil but a searching gas or vapor, such as nitrogen oxides, chlorine, hot air, superheated steam. Dry earth, charcoal, peat and cinders will absorb and fix offensive matters, but have little power to disinfect.

Some disinfectants act by oxidizing, others by deoxidation: one will destroy anaërobic bacteria, the other kills the aërobic—the oxygen-consumers. Other agents, acting on feculent matter, form, by substitution, new and non-putrescible compounds; another class coagulate albumen and exert an undetermined destructive influence on all micro-organisms. Tannins and mineral astringents attack albuminoid and chitinous bodies. Certain solutions act as antiseptics and sterilize the mother of infection, while they do not harm the hardy species of the microzoa when matured, like certain vibrios that still live and thrive, and agitate their cilia rejoicingly. The skins of many forms of infusoria contain much cellulose, that resists weak acids, alkalies and feeble oxidizers, but all infusorial life succumbs to phenols and the halogen-elements. Wherever chlorine can be used it is effective; diffused through the air it decomposes and combines with the offensive sewage gases, hydrogen sulphide, methane and ammonia, which are not the causative principles of infection, while it also removes the peculiar and indescribable odors that usually accompany putrefactive emanations and seeks out and destroys nonodorous seeds of contagion.

It has been said that a quantity of chlorine sufficient to neutralize polluting germs, would prove injurious to man, but mere pure air is deadly to those germs, and one familiar with ozone, a natural disinfectant of the atmosphere, will hardly fear a little chlorine in the air. The use of larger proportions of chlorine, acting for a time within a confined space, is the most efficient of practicable methods of disinfection. Ten grains of chloride of lime, in solution, will disinfect a gallon of city sewage, but other chemicals are often preferable for this and similar purposes. Disinfecting agents should be used understandingly in every case, and one in doubt should consult his physician or a competent chemist. Only approved disinfectants should be employed and these in sufficient quantities. A few grains of thymol, a sprinkle of X's mysterious powder, or a spoonful of permanganate solution in a saucer—these are things too puerile for consideration. The refuse from certain manufactural operations may be utilized for the economical disinfection of large masses or areas, and the presence of such residuums in water reservoirs or running streams tends to prevent the development of zymotic germs.

Water may be freed from organic impurity by chemical means, but the best way to render it potable was pointed out by Hippocrates when he declared that suspected waters should be "boiled and strained." Mere filtration will not give immunity from infection, but advantage accrues from the use of freshly burned charcoal or spongy iron.

* Nec doctissimis.

† "Aer ex ferto mare."

‡ The infectious character of phthisis pulmonalis was recognized by Isocrates.

* The plague Thucydides describes resembled a malignant scarlatina.

HOW MUCH SHALL THE DOCTOR BE PAID?

What may the physician reasonably demand for his services? is a question that he and his patient are not always agreed on; and there being, unhappily, no fixed charge for medical attendance in this country, the physician, naturally enough, strives to obtain as much as he can.

Unless a contract is made before the services are rendered—rarely the case in the treatment of irregular patients—a physician can make any estimate he likes as to the value of his services, and the courts are continually being asked to examine into physicians' charges. The fact that juries rarely sanction these charges would indicate that they are apt to be extortionate.

In a recent paper in the *Medical Record* on "How Much Shall the Doctor be Paid?" a writer lays down some really excellent rules for deciding upon the value of medical services. He says:

"In considering the question of the amount of compensation due the physician or surgeon for his professional services, there are two or three preliminary points which require an answer favorable to the practitioner. There must be no doubt as to the fact of the services being faithfully and skillfully rendered, and the charge of malpractice must not be raised against him. If there is a question as to the skillfulness of the treatment, the compensation may be seriously cut down; or if an improper or harmful mode of treatment has been adopted, the right to any compensation at all may be denied, and the patient allowed to recover damages instead."

This is fair as far as it goes, and if the writer had laid down a rule for deciding what medical services are worth when successful, and just how much the doctor should hand over to his patient as compensation for rendering his case more desperate than it was when he began his ministrations, nothing would be wanting to make it as easy to deal with a physician or surgeon as it is with a mason or a brass finisher.

A physician, for instance, who poisoned his patients while experimenting with new qualities of vaccine virus, instead of charging them for the medical attendance necessary to insure their recovery, should pay to each a fair compensation for loss of health, etc.

As to what a physician should be paid when successful in his treatment could readily be determined, were it not for the fact that the unskillful are inclined to regard their services as of the highest market value.

The fact is that although in no profession there is to be found more ability and faithfulness to duty than in the medical, there is at the same time no profession in which quackery can ride rampant with such impunity. The physician who lives in a great house and rides about in state has no trouble in obtaining large fees for his services, even though these consist for the most part in feeding bread pills to old ladies and patent medicine to old gentlemen with the gout, whereas the obscure man, often of really commanding ability, often finds difficulty in obtaining small fees for really skillfully performed operations.

Dickens, a careful observer of character, understood this credulity of the public. His Mr. Bob Sawyer built up a flourishing apothecary business by sending his boy around to leave prescriptions at different houses, and then calling later to explain the mistakes. This gave the impression that he was doing a large business, and was therefore at least a fashionable, if not a skillful, compounder.

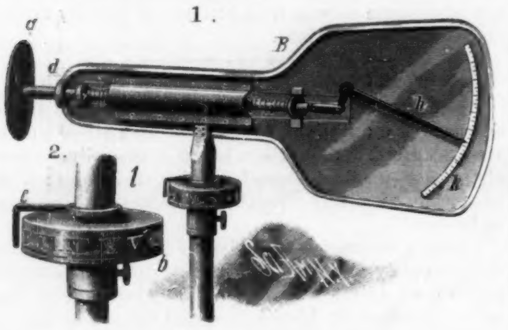
Patents in the Hawaiian Islands.

The authorities of the Hawaiian Islands have recently enacted a patent law, and the King has sanctioned the promulgation of its provisions. The term far which a patent may be taken is ten years. Applicants are allowed one year after the issue of the earliest patent in another country or the introduction of the article into the islands, to file their cases. The law governing the proceedings before the tribunal, and the final issuing of patents, is modeled after the United States patent laws, and the cost is about the same as an English patent.

Inventions may be secured for one year by caveat. Other particulars may be had on application to the office of this paper.

IMPROVED ANEMOMETER.

The engraving shows a simple and inexpensive device for determining with approximate accuracy the velocity of the wind at the moment of observation, and particularly adapted for the use of riflemen at target practice, which was recently patented by Mr. Eaton A. Edwards, of Fort Meade, Dakota. The post or standard has a folding tripod base for firmly supporting it. The vane, B, has a thimble, *l*, stepped on top of the post to allow free rotation, and the thimble has a pointer, *c*, moving in connection with a numbered dial, *b*, for indicating the direction of the wind with reference to the target; in other words, the apparatus being set so that the vane points to the target when the pointer is at

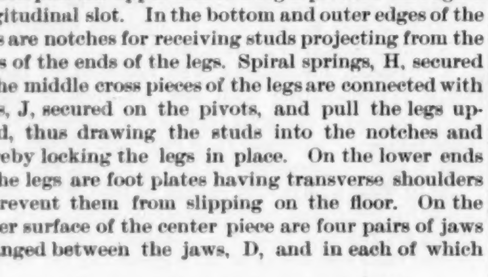


EDWARDS' IMPROVED ANEMOMETER.

zero, the position at right or left will indicate the angle at which the wind blows across the line. Sliding in a slot in the vane is the spindle, *d*, around which is a spiral spring that takes behind a collar on the spindle, and on the end of the spindle is a disk, *g*, the area of which is a convenient part of a square foot. On the large end of the vane is pivoted a pointer, *h*, connected by a link with the end of the spindle, and a properly graduated fixed quadrant, *k*. The pressure of the wind on the disk causes an inward movement of the spindle, and that in turn swings the pointer so that it indicates on the scale the velocity of the wind calculated from the pressure in pounds per square foot, at any moment.

FOLDING CHAIR.

A folding chair, invented by Mr. G. E. Vandenburgh, Box 276, Stillwater, N. Y., is simple in construction, strong, and durable, can be folded very compactly, and can be erected or folded easily and rapidly. It consists of a center piece, A, four hinged legs, B, and four seat supports, C. The center piece is provided with four pairs of jaws, D, projecting from the centers of its sides, and in each pair the upper end of a leg is pivoted through a longitudinal slot. In the bottom and outer edges of the jaws are notches for receiving studs projecting from the sides of the ends of the legs. Spiral springs, H, secured to the middle cross pieces of the legs are connected with bails, J, secured on the pivots, and pull the legs upward, thus drawing the studs into the notches and thereby locking the legs in place. On the lower ends of the legs are foot plates having transverse shoulders to prevent them from slipping on the floor. On the upper surface of the center piece are four pairs of jaws arranged between the jaws, D, and in each of which



VANDENBURGH'S FOLDING CHAIR.

the lower end of a seat support, C, is pivoted through a longitudinal slot. On each side of the end of each bar is a stop lug; these rest on the top edges of the jaws when the bars are at the required inclination, and lock them in place. The seat, made of canvas or other suitable material, is riveted to the upper ends of the seat bars, and is strengthened by two diagonal bands. Fig. 1 shows the chair erected, Fig. 2 is a cross section through the middle part, and Fig. 3 is a plan view. To fold the chair the bars, C, are swung toward each other, and the legs are pulled downward to draw the lugs out of the notches, and are then swung upward until they lie parallel with and next to the bars, C. When folded in this manner, the chair can be placed in a casing to facilitate carrying it.

Refrigerator Cars and Perishable Freights.

Railway tonnage has reached its present magnitude in this country by a rapidity of development little dreamed of in the first stages of its growth. It has kept on increasing with scarcely any check during prolonged periods of general business depression, sustained as it is by the ever-increasing products of a vast territory and the industrial activities of a population increasing at the rate of a million and a half a year. The carrying capacity of the roads has grown with the demands made upon it, until there would seem to be no assignable limit to either. Articles are transported every year of a kind that were never transported before; and if the cars already in use are not adapted to the new traffic, special cars are soon devised and built that are suitable for the purpose.

An illustration of this is afforded in the remarkable growth of the transportation of perishable commodities within the last few years by means of refrigerator cars. Every year adds to the volume of this traffic, and although the business is attended with some drawbacks in the way of losses from delays in transit, it is bound to keep on increasing to an indefinite extent. The shipment of dressed meats from Chicago and other points further west to the Eastern seaboard has already grown from small beginnings to a heavy traffic, while the semi-tropical fruit products of Cuba, Florida, Mexico, and Southern California are finding their way to Northern markets during the warm season in larger quantities every year in refrigerator cars so well adapted to the purpose as to make the losses from the perishable nature of the freight comparatively light. The extent to which this branch of traffic will be developed in future is at present a matter of conjecture, but it is likely to be large.

In regard to dressed meats, everything depends upon its condition and price at points of destination as compared with shipments on the hoof. The abuses practiced in live stock transportation from the Far West, under the spur of competition, are necessarily attended with serious shrinkage in weight, to say nothing of the alleged deterioration in the quality of the meat, especially beeves, upon reaching the Eastern stock yards. Only a few years ago the dressed beef business between Chicago and New York was in need of friends to sustain it against the stock yard interests; but since then it has been steadily gaining ground, and it is now said the number of cattle slaughtered last year in Chicago by the principal dressed beef shippers was 694,026, which was an increase of twenty per cent over that of the previous year. To this must be added 128,000 sheep shipped in carcass. The number of dressed hogs is not stated.

This would seem to support the claims of the shippers that dressed meats, and especially beef, are received at destination in much better condition for consumption than when shipped alive. It is also stated that the cold storage business is increasing at a corresponding rate, buildings for this purpose having been erected in upward of one hundred Eastern towns, exclusive of the chief cities, for receiving these shipments.—*The National Car-Builder.*

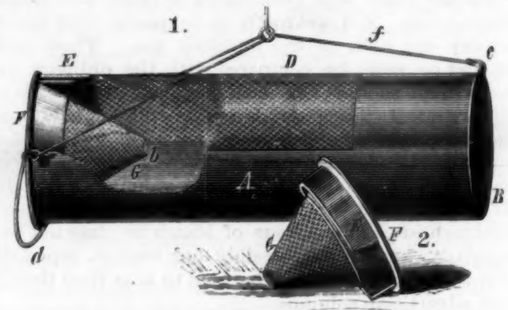
AN AUTOMATIC DISINFECTER.

In the accompanying engraving is shown a simple contrivance, by means of which all the water used in flushing water closets can, before it passes through the closet, be impregnated with a powerful disinfectant. The device is inserted in the pipe leading from the tank or from the ordinary service pipes, and consists of a small box, closed airtight, and divided into two compartments. The sides of each of the chambers, A F, are perforated to permit the water to flow through; the perforations begin a short distance from the bottom, thus forming in each chamber a shallow tank, B, which is constantly filled with water. Through the airtight screw cap, C, a disinfectant is introduced into the chamber, A, and rests in the tank at the bottom. Water from the reservoir enters the chamber, F through the pipe, D, passes to the chamber, A, and thence through the holes to the pipe, E, and to the closet. The water in the shallow tank, being in constant contact with the disinfectant, becomes strongly impregnated, and at each flushing is displaced by the fresh water and sent through the closet. The small holes in the sides of the chamber, A, prevent the escape of small pieces of disinfectant, and by means of the dividing partition the disinfectant is not subjected to the wash of a rapid current of water. As the water flows into the box the air in the top is compressed, thus aiding the discharge through the pipe, E, after the closing of the valve. In placing this device in position, no change is necessary either in the closet or connections. It is also applicable to wash basins and other receptacles which would be rendered more safe by the passage of a disinfectant through them.

Additional particulars can be obtained from the Automatic Disinfecter Company, of 852 Broadway, New York city.

FISH TRAP AND BUCKET.

The device herewith illustrated is a combined minnow trap and bait holding receptacle. The cylinder, A, is closed at one end by the head, B, and at one side is cut away, the opening thus formed being covered by the screen, D. Fitting within the open end of the cylinder is a flanged ring, E, within which is an inclined ring terminating in a screen cone, G, having an opening, *b*, in its apex. A handle, *d*, is attached to loops secured to the side of the cylinder. To use the device as a minnow trap, the bait is placed in the cylinder and the cap, F, put on. It can then be suspended in a horizontal position in the water by means of the cords, one of which is attached to the eye, *e*, and the other passes through side eyes across the front to hold the cone in



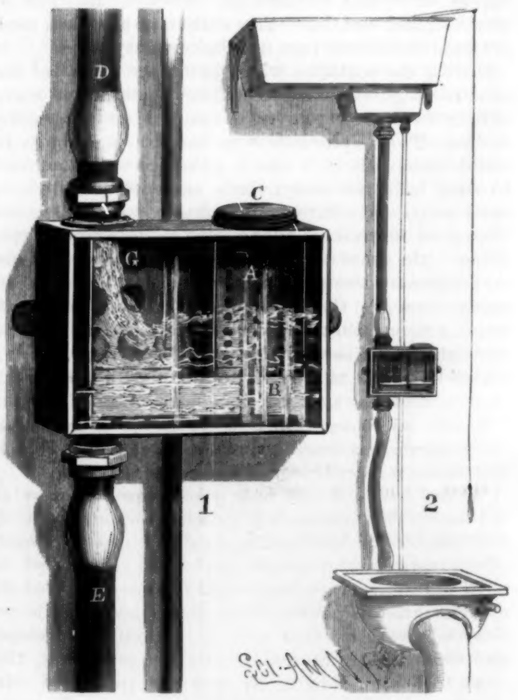
McKINNEY'S FISH TRAP AND BUCKET.

position. The minnows, attracted by the bait, find their way through the opening, *b*, to the interior, and are prevented from passing out by the peculiar shape of the section, G. When the device is used as a bucket, it is carried in a vertical position by means of the bail, the water in the cylinder below the screen, D, being sufficient to keep the bait alive.

This invention has been patented by Mr. George H. McKinney, of Silver Creek, Ky.

The Caspian Petroleum Wells.

The news from Baku shows that the production of naphtha goes on increasing. The Caspian Company has just made a boring 660 feet deep, into which a 6½ inch pipe has been sunk, and the flow of naphtha equals 1,600 tons per day, or from 400,000 to 500,000 gallons. M. Debour, close to the above company, has a flow of 340 tons a day, while the Baku Company, with its 12 inch bore, is able to regulate the quantity by simply opening and shutting the valve on the top of the bore, and can take up to 1,500,000 gallons a day. Steamers from Batoum to Marseilles will now run twice a month, and the export trade from Batoum is rapidly extending. During 1884, from Batoum to Triest, 18,000 casks of distillate (naphtha once distilled) were exported, and to Fiume 13,600 casks, while to Genoa 20,000 boxes of kerosene were sent,



AN AUTOMATIC DISINFECTER.

and to Venice 71,000 boxes. Evidently the whole of the Mediterranean trade will come into the hands of the Russians.

A Large Locomotive.

There is being built at the Tabize works, says *Le Genie Civil*, a monster of a locomotive which will figure at the Anvers Exposition. This engine will be the heaviest and largest that has ever been constructed since the establishment of railroads. It will have ten wheels of more than a yard in diameter, and will weigh, in running order, 165,000 pounds.

BOILER CLEANER.

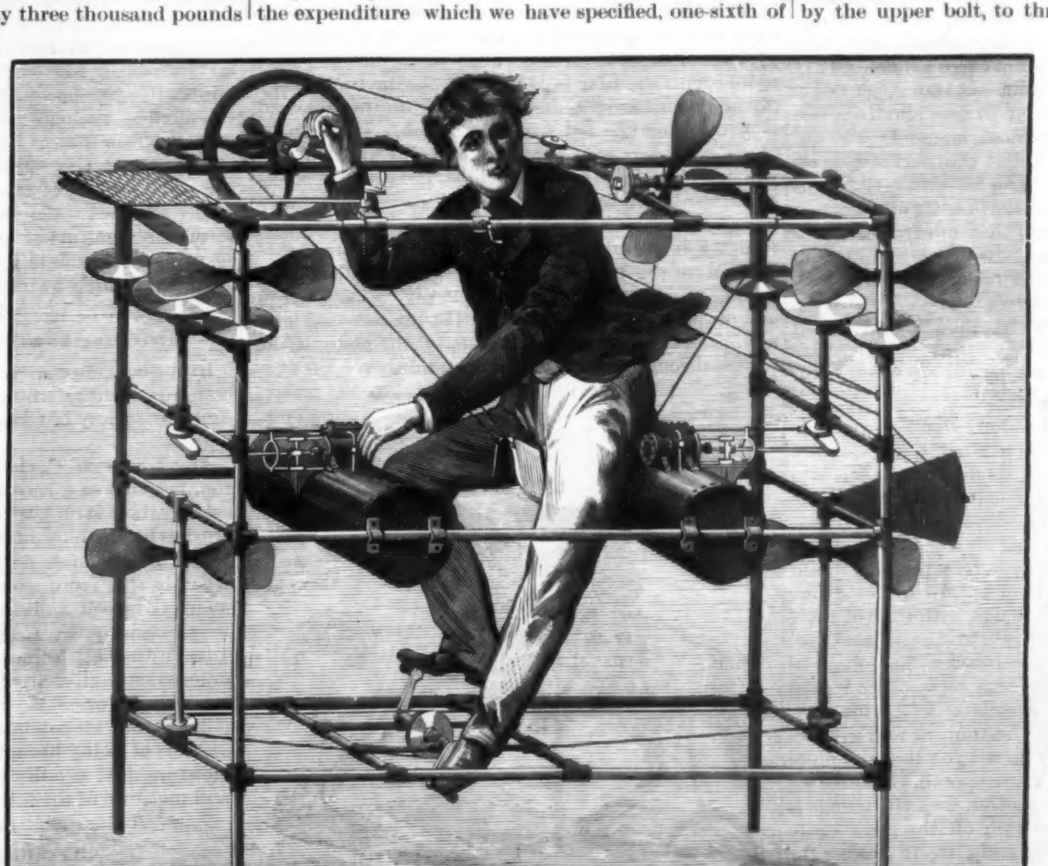
The object of this invention, patented by Mr. George A. Galloway, of Le Claire, Iowa, is to provide means for cleaning the fire surfaces of soot and other accumulations. The cleaner is constructed of two curved pipes connected to a T and bent to the shape of the boiler, their length being according to the extent of fire surface. The ends of the tubes are closed by plugs, and the upper side of the tube is formed with holes made so as to discharge steam at about an angle of 30 degrees. To the T is attached a tube of suitable length for use in handling the cleaner, and also for supplying steam, for which purpose the outer end of

GALLOWAY'S BOILER CLEANER.

the handle is connected by a flexible pipe with the boiler. In using the cleaner, it is inserted in the fire box and moved closely over the fire surface of the boiler, when the jets of steam act to remove the soot and scale. This action renders the surface cleaner, and results in a great saving in fuel by the removal of those non-conducting materials which always accumulate on the fire surface of a boiler.

A NEW AERIAL MACHINE.

We illustrate a new plan for aerial navigation designed by Dr. W. O. Ayres, of New Haven, Conn. In this apparatus the motive power is to be compressed air, which is intended to be condensed within the two drums, seen in the engraving; the air also fills the tubular framing of the machine. The air will be condensed under a pressure of say three thousand pounds to the square inch. The drums and tubes are expected to hold air enough to drive the engines and attached propellers for several hours. The author gives the following additional particulars:



AYRES' NEW AERIAL MACHINE.

"The plan and form which we suggest is not designed or expected to be by any means exclusive. The illustration shows it very clearly, and we believe that a machine constructed as here represented can do its work successfully. The propellers may be made to present a much greater extent of surface than the artist has drawn; the only thing for which we contend is that the principle shall be maintained.

"In order to afford support for our two systems of propellers, we must necessarily have vertical posts and horizontal bearings as well, that is, a table-like frame One of four feet by three, supported by four legs four feet in height, will give us the required space, and if made of steel quarter-inch tubing, will have all the strength needed. The rider sits in a seat like that of a bicycle, suspended by steel wires from the top frame, with which his shoulders are about level.

"The four horizontal propellers have their bearings on the vertical posts just below the top frame, thus bringing the lifting power as far above the center of gravity as possible. The vertically moving propeller revolves on a shaft behind the shoulders of the rider, midway between the side bars of the top frame. The air cylinders are two, for better division of weight, but are so connected that practically their air mass is one. A driving engine is attached to each cylinder, but the two work synchronously, and the regulating valve is controlled by the rider's left hand. They are so geared as to propel the upper horizontal fans, which have been already mentioned.

"The rider's feet rest on pedals like those of a bicycle, and by suitable connection actuate two horizontal fans as shown, so that the entire strength of his lower extremities can be brought to the assistance of the compressed air in the work of 'lifting.'

"The vertically revolving propeller is driven by the right arm of the rider, and the gearing, as shown, is very simple. An ordinary crank handle is conveniently placed for his grasp, and he drives the fan by direct motion.

"The rate at which these sets of propellers must be driven, so as to do effective work, can be determined only by actual experiment. We have no data from which to calculate with precision. The formulas that apply to boat propellers can give us but little aid, since the circumstances are so diverse. It is, however, probably safe to assume that the motion can be advantageously made much more rapid in air than in water.

"Thus far we have only two motions, vertical and horizontally direct; but our apparatus must be steered precisely like a boat, and it must ascend and descend obliquely. The former scarcely needs mention; the rudder, as shown, is controlled by cords whose 'wheel' is on the upper bar near the rider's left shoulder. But for ascent we need a new arrangement, though a very simple one. A flap or plate, twelve inches square, is hinged on the anterior cross bar, capable of motion in a vertical direction only. It must possess no little firmness and strength, and will need to be made of tubing like that of the main frame, covered with linen or silk. It is so controlled by strong cords or chains that it can be set at any required angle, and held there rigidly. Its 'wheel' is just in advance of that of the 'rudder,' as shown.

"This plate has no influence on the elevating power of the horizontal fans; but supposing them to be in motion, at just such a rate as to counterbalance the power of gravitation, then, with the vertical fan in action, the angle at which this horizontal rudder is set will determine the gradual elevation or descent of the machine.

"The apparatus, thus constructed, can all be brought within the weight of 65 pounds, and we have therefore to provide for lifting 225 pounds, assuming operator to weigh 160 pounds. This can certainly be done with the expenditure which we have specified, one-sixth of a nominal horse power, aided by the efforts of the rider."

A HARPOON of the pattern made over forty years ago was taken from a whale caught near Coos Bay, Oregon, recently.

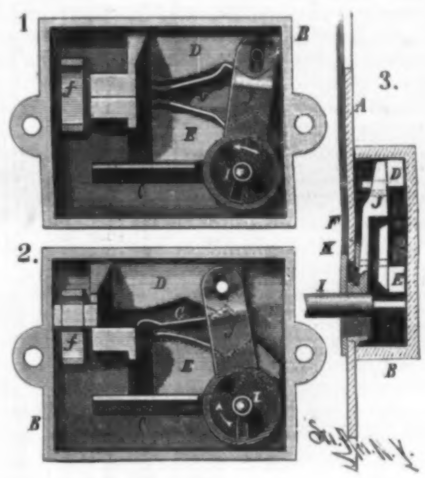
TRUNK LOCK.

The lock shown in the accompanying cut is especially designed for trunks, and is one that requires a special transverse manipulation of the key to unlock it. Between one of the side walls of the case and a lug, C, on the inside of its back plate are two bolts, D E, sliding independently of each other; the ends of the bolts enter the eye, *f*, of the hasp, which is hinged to the trunk lid in any approved way. The spring, G, having opposite arms, acts against the opposing edges of both bolts, so as to hold either in the projected or withdrawn po-

1

2.

3.



DUPONT'S TRUNK LOCK.

sitions. The lower bolt has a notch, shown by the dotted lines in Figs. 1 and 2, to receive the bit of the key, by which it may be thrown either way when the key is pushed in as far as it will go. The arm, J, is held to the inside of the face plate by a split collar, K, upon which the arm is free to turn. The arm is connected to the inner end of the upper bolt by a pin entering a slot, so that the arm will throw the bolt either way when the bit of the key is held forward from the back plate so as to come within the hub of the arm. The keyhole in the hub coincides with the keyhole in the escutcheon when the arm is thrown out.

If an attempt were made to open the lock by any one unacquainted with its construction, the key, being naturally pushed in as far as it would go, would throw the lower bolt back, but the hasp would still be held by the upper bolt, to throw which it is necessary to draw the bit of the key outward clear of the lower bolt and into the hub of the arm, J. When this arm has been thrown back, its keyhole is out of line with the keyhole of the escutcheon; hence after unlocking the trunk the key can only be withdrawn by throwing the bolt outward.

This invention has been patented by Mr. L. E. Dupont, P. O. box 104, Farnham, Quebec, Canada.

Powerful Refrigerants.

Some experiments recently made by M. Olszewski appear to show that liquid oxygen is one of the best of refrigerants. He found that when liquefied oxygen was allowed to vaporize under the pressure of one atmosphere, a temperature as low as —181·4° C. was produced. The temperature fell still further when the pressure on the liquid oxygen was reduced to nine millimeters of mercury. Though the pressure was reduced still further to four millimeters of mercury, yet the oxygen remained liquid. Liquefied nitrogen, when allowed to evaporate under a pressure of sixty millimeters of mercury, gave a temperature of —214° C., only the surface of the liquid gas became opaque from incipient solidification. Under lower pressures the nitrogen solidified, and temperatures as low as —225° C. were recorded by the hydrogen thermometer. The lowest temperature obtained by allowing liquefied carbonic oxide to vaporize was —220·5° C.

Wall Paper.

The following table from the *N. Y. Newsdealer* shows how many rolls of wall paper are required to cover a room of the dimensions indicated by the figures in the left hand column, also the number of yards of border necessary:

Size of Room.	Height of Ceiling.	Number of Doors.	Number of Windows.	Rolls of Paper.	Yards of Border.
7 x 9	8	1	1	6	11
"	9	1	1	7	11
"	10	1	1	8	11
"	12	1	1	10	11
8 x 10	8	1	1	7	12
"	9	1	1	8	12
"	10	1	1	9	12
"	12	1	1	11	12
9 x 11	8	1	1	8	14
"	9	1	1	10	14
"	10	1	1	11	14
"	12	1	1	13	14
10 x 12	8	1	1	9	15
"	9	1	1	10	15
"	10	1	1	11	15
"	12	1	1	13	15
11 x 12	8	2	2	8	16
"	9	2	2	9	16
"	10	2	2	10	16
"	12	2	2	13	16
12 x 13	8	2	2	8	17
"	9	2	2	10	17
"	10	2	2	11	17
"	12	2	2	14	17
12 x 15 or 13 x 14	8	2	2	10	18
" "	9	2	2	11	18
" "	10	2	2	12	18
" "	12	2	2	15	18
13 x 15	8	2	2	10	19
"	9	2	2	11	19
"	10	2	2	13	19
"	12	2	2	16	19
14 x 16	9	2	2	12	20
"	10	2	2	14	20
"	12	2	2	17	20
14 x 18	9	2	2	13	22
"	10	2	2	15	22
"	12	2	2	19	22
15 x 16	10	2	2	15	21
15 x 17	12	2	2	19	22

Deduct one-half roll of paper for each ordinary door or window extra—size 4 x 7 feet.

A New Sewage Process.

At the suggestion of Dr. Tresh, a novel process has been devised for treating the sewage of Buxton. The precipitant brought into play is simply a mineral water derived from the lower coal formations about two miles above Buxton. It contains 1·2 grs. of iron per gallon in the state of ferrous carbonate, held in solution by carbonic acid. On exposure to the air the carbonic acid escapes, and the iron, taking up more oxygen, subsides in the state of ferric hydroxide in combination with a considerable part of the organic impurities, suspended and dissolved. The results, according to an analysis quoted in the *Leek Times*, are very satisfactory. The sewage before treatment contains free ammonia 11·74 per million, and albuminoid ammonia 1·60. After treatment these figures are reduced to free ammonia 4·00 parts per million, and albuminoid ammonia 0·30 do. The sewage is decidedly weak, but the purification effected is very satisfactory, coming far within the limit proposed by the late Rivers Pollution Commissioners, and supplying additional proof that mineral salts are fully capable or precipitating dissolved organic impurities. Such waters are not uncommon, and may find similar applications elsewhere. The only unsatisfactory point which we note is that the effluent is stated as being "distinctly alkaline."

The Walnut.

A writer in *The Garden* (London) wonders why this tree is comparatively but little planted, a singular fact when the beauty and value of its wood are taken into account. For gunstocks and much of our finer sorts of furniture, walnut timber is invaluable. Walnut trees, moreover, are free growing on almost all kinds of soil, and the crops of nuts which they produce would pay at least the rent of the land on which they grow, while freeholds might be purchased with trees of fourscore years of age. Walnuts in a landscape, also, are trees of mark, their magnificent heads of fine foliage in parks or paddocks rendering them especially adapted for such situations. They associate well with oak, beech, elm, sweet and horse chestnut, as well as with various other trees, and they do not rob the land more than their companions do. Their smooth, glossy leaves are washed clean by every shower, and the foliage is not so thick as to throw the rain off the grass or to keep air currents from circulating freely among the branches. There are, therefore, no trees either in park or pasture under which herbage grows better than it does under walnuts. Besides, walnuts come into leaf late, make their growth quickly, and lose their foliage nearly all at once after the first autumn frost. Thus a chance is given to take the leaves out of the way, so as not to injure the grass, while the shining dark young wood, with the grayish mature limbs, are left full in view. As to any tree that will grow more quickly into a size to be useful, I do not know where to look for it. I have seen old walnut trees that measured from 60 feet to 90 feet high; diameter of branches from 60 feet to 96 feet; and of bole or trunk from 3 feet to 5 feet diameter; and no doubt larger trees are elsewhere to be found.

A NOVEL TOY.

The body of the toy has rockers or runners secured to it, and is composed of a bottom and curved cover in imitation of a locomotive, the cover being closed at its forward end and open at its rear end, and extended to form side pieces and seat supports, which are braced by a cross piece at the front edge of the seat board. A rail is placed around the seat board. To the cover are secured a smokestack, cylinders, and piston rods in imitation of these parts on a locomotive, and to the tongue of the bell is attached a string by which the bell may be struck by a child sitting upon the seat. Between the forward ends of the rockers is a round to which the tongue is secured, by which the toy may be drawn along the floor. Through the runners are formed

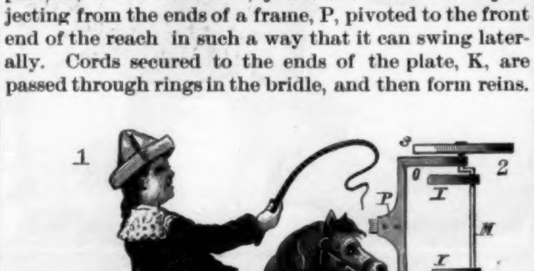
NICHOLS' NOVEL TOY.

openings to receive axles carrying wheels upon their ends, upon which the toy may be run instead of upon the rockers. The toy is adapted for use as a sled or wagon, or as a rocking toy, and being made in imitation of a locomotive is very attractive to children.

This invention has been patented by Mr. John B. Nichols, of 43 King Street, New York city.

HOBBY HORSE.

The hobby horse herewith shown can be propelled by working or rocking it up and down, and can be steered easily. The rear end of the reach, A, is provided with a rigid cross piece whose ends are bent upward to form standards in which the axle is journaled. This axle is bent to form a crank part connected by a rod, L, with the rear part of the horse body, which is pivoted about at its center of gravity on the standard, H, projecting upward from the reach. To the hoofs of the front legs is secured a plate to the under side of which a forked plate, K, is pivoted, the prongs projecting toward the front and having their ends bent to form eyes for receiving the cross piece of a connecting frame, I, having its opposite end pivoted on the crank part, M, of the front axle, journaled in standards projecting from the ends of a frame, P, pivoted to the front end of the reach in such a way that it can swing laterally. Cords secured to the ends of the plate, K, are passed through rings in the bridle, and then form reins.



SPITZNASS' HOBBY HORSE.

The wheels are all rigidly mounted on the ends of the axles. By rocking the horse, the crank axles and wheels are revolved and the vehicle propelled. By pulling the cords the plate, K, is swung toward the right or left, and the frame, P, is turned with it, thus guiding the horse. Steering the vehicle does not interfere with its being propelled.

This invention has been patented by Mr. William Spitznass, of New Athens, Ill.

A Day for Tree Planting.

The conservation, so far as possible, of such timber land as we have left, and the encouragement of tree planting in other places, has been earnestly urged by far-seeing men for a score or more years past. To say nothing of the direct value of the wood itself—hitherto so abundant with us as to lead to every sort of waste—the effects of tree growth on the climate and in the prevention of freshets are admittedly so great as to make the subject one of the first importance, to which people are becoming awakened in proportion to the rapidity with which our native forests are being destroyed.

Among the most practical of the means urged for encouraging tree planting, in such a general way as shall be productive of national good, the making of a special holiday therefor, to be called "arbor day," seems to be a popular idea. This was first done in Nebraska, about a dozen years ago, and her heretofore almost treeless prairies have gained 250,000 acres of artificial woodland as the result. Several other States now have an "arbor day" the dates of which are annually proclaimed by the Governors thereof; and under the impetus thus given to tree planting, large areas are at present covered with an artificial growth in Dakota, Iowa, and Minnesota. April 16 was "arbor day" in Pennsylvania, and was generally celebrated by tree planting throughout the State, especially by the school children. In New Jersey, New Hampshire, Massachusetts, and Connecticut, a similar day was also observed, though not so generally, but the idea has been received with favor, and the custom promises to take root.

We have no schools of forestry, such as there are in Europe, but the National Bureau of Education has recently issued a circular on this subject, more especially intended to encourage the planting of trees in school grounds, and by school children, but also calculated to promote the lining in this manner of public highways; its contents are such, likewise, as to impress upon all the importance of doing something toward raising an artificial growth to counteract our present enormous drain upon the original forests. Well wooded as the whole country once was east of the Mississippi River, we can now almost foresee the period when, at our present rate, timber will be very scarce and costly. West of the Mississippi the tracts destitute of timber, the almost sterile wastes, are far larger than most people have a clear idea of. They embrace a large portion of Arizona, New Mexico, Colorado, Utah, Nevada, Wyoming, and also parts of Kansas, Nebraska, and Oregon. Any general movement to promote tree planting throughout the older States should be emphasized in these almost treeless sections, where an increase in forest growth would undoubtedly diminish the regions of droughts, and lessen the force of the terrible cyclones now so frequently experienced there. Trees increase the rainfall, but prevent flood; they mitigate the rigor of winter, and stop the progress and ferocity of storms; and, though tree culture seems so slowly remunerative, some of our best informed agriculturists and economists look upon tree planting as, in the end, among the best paying of investments which owners of land can make.

Interesting Low-Temperature Experiments.

In the course of a recent address by Mr. J. J. Coleman, president of the chemical section of the Philosophical Society of Glasgow, he mentioned the following:

At about −86° C. the flesh of animals, such as mutton, becomes so exceedingly hard that it rings like porcelain when struck with an iron instrument, indeed crushes by the blow of a hammer into a fine powder, in which muscle, fat, and bone are intermingled; and, what is still more singular, according to the experiments of myself and Prof. McKendrick, recently communicated to the society, it appears that microbia alive in the flesh before the freezing operation can be detected still alive after thawing, even after exposure to −86° C., or −133° F., for one hundred hours—this pointing out to potential animal life in the solid state capable of being brought into activity by heat and by moisture, just as a dry pea shoots into activity by heat and moisture of the soil and the heat of the sun.

Leveling a Turret Bed.

An interesting application of machine power has been carried out on board the turret ship Hecate. From the deflection of the ship by the heavy weights of the guns and turrets, the beds of the turrets, or planes on which they rotate, have got out of line, and it has been found necessary to resurface the fixed beds. To have taken off the turrets and resurfaced their beds would have cost a considerable sum. To avoid this, steam has been got up in one of the boilers, and the engines which drive the turrets have been worked so as to make the turrets revolve at a very slow rate. Fixed to the turrets is a tool held in a slide like a slide rest. The edge of the tool is brought into contact with the fixed bed, and thus made to plane the bed and restore it to its original evenness.

Correspondence.

A Hydraulic Rudder.

To the Editor of the Scientific American:

If all large sea-going vessels were supplied with the below described auxiliary to the rudder for steering, the accident to the Alaska's rudder would not have endangered the vessel or have been of greater import to her owners than the mere cost of replacing the broken part. The attachment works admirably with smaller craft, either as an assistance to the rudder or alone and without any rudder, and I see no reason why all steam vessels should not have it, considering how trifling the cost.

It consists simply of two discharge pipes, placed one at each side of the vessel's stern as far below the water line as possible, connected with a steam pump capable of forcing a powerful stream of water through the pipes, which, impinging upon the water in contact with the vessel, forces it (the vessel) to the side opposite to that from which the stream is issuing. A one-half inch nozzle operates very well for a boat 30 feet long; a vessel of the size of the Alaska would probably require a 6 or 8 inch pipe. To vessels of war it would be particularly useful to enable them to turn quickly, or even without headway. A. P. WHITTELL.

San Francisco, Cal., April 4, 1885.

Bumble Bees and Honey Bees.

To the Editor of the Scientific American:

In your issue of April 11, you note a curious article of export for New Zealand, viz., bumble bees, but question why honey bees would not do as well. Honey bees cannot extract the honey from red clover. Their proboscis is too short, consequently they never disturb it; it is the white clover they seek. This is not the first shipment of bumble bees; the same experiment was tried with Australia some years since, and with success. It is a fact that without the bumble bee in two years we would be without clover, one of the best fertilizers known to agriculture. Few bumble bees live over the winter, and their number is not sufficient to fertilize the first growth of clover, as not more than 5 per cent of the first crop has seed; but by the time the second crop comes on the bees have increased, and as a consequence we get seed, with sapling clover.

JAMES M. HENDRICKS.

Shepherdstown, W. Va., April 13, 1885.

The Extensive Action of Ocean Waves.

To the Editor of the Scientific American:

During a long experience on the several oceans, I have noticed that the heavy waves caused by winter storms in high latitudes often move far beyond the limits of the winds which produce them. The strong northwest gales which sweep over the north Atlantic abreast the British provinces and New England often send gigantic waves to the southwest far within the trade wind region. These waves at times invade the western coast of Africa from Morocco to Cape Verd, so that vessels have been swamped by heavy rollers while at anchor in the open roadsteads, notwithstanding light winds and calms prevailed on the African seas. The shores of the tropical Cape Verd Islands are also dashed by heavy waves from the northwest. The island of St. Helena, situated in 16° south latitude, is reached by heavy seas from the same direction, which make it impossible to land while they are in force, and at times vessels anchored near the shore are wrecked. The southwest gales of the southern ocean often send their waves far into the tropical latitudes, reaching the shores of Peru and Central America in the Pacific Ocean, and the beaches of Guinea in the Atlantic. These waves show their greatest volume during periods of torrid calms, as they have not force sufficient to cross a tropical ocean in the face of a strong trade wind. In consequence of the prevailing gales of the high latitudes being westerly the western shores of continents are dashed by heavier waves than their eastern coasts, even in the tropical regions where the prevailing winds blow from the eastward. C. A. M. TABER.

Wakefield, Mass., April 9, 1885.

Oil on the Waves.—A Guide to Fishermen.

To the Editor of the Scientific American:

I recently read of a writer who was unable to account for the numerous smooth tracks he had seen upon the ocean when no vessels were in sight from which oil or grease could have been thrown to cause them. Had he been acquainted with the nature and habits of fish even in a small degree, the mystery would easily have been solved. The menhaden, or moss bunker, is an especial victim for all biting fish, and they, being of a very oily nature, will when bitten by other fish exude oil, which immediately rises to the surface. Thus it will be readily understood that when a large body of bluefish, weakfish, or sharks fall upon a shoal of menhaden, and follow them up for miles, it will produce the smooth tracks which the writer referred to could not account for.

If any one is inclined to doubt the statement above, let him take a few bunkers on the bay or river, when the wind is blowing fresh, and score their sides, then cast them in the water and watch the result.

The first appearance of a "slick" (as fishermen term it) is eagerly watched for by fly net men, as it generally denotes the exact locality of blue or weak fish in the act of feeding upon bunkers or other small fish. I have seen a thousand or more bluefish taken at a single haul by simply casting a net around one of these smooth spots when it first appeared on the surface, and no other sign of the presence of fish could be seen.

A few years ago a whale was washed ashore near Fire Island inlet, and the action of the surf and sand chafed the skin until the oil began to ooze out, causing the surf to smooth down for a considerable distance each way, and when the wind was from the north would make a smooth streak out on the ocean, a mile or more in width, as far as the eye could reach. A dead shark or porpoise at sea will produce the same thing. So the smooth tracks upon the ocean need not longer be a mystery. W. L. WEEKS.

Bay Shore, N. Y.

Why Certain Kinds of Timber Prevail in Certain Localities.*

It has often been observed that in certain localities a certain species of timber will prevail, or be more numerous than any, and sometimes than every, other kind. It has been further observed that when any prevailing timber has been cleared away, and the land allowed to grow up again in timber, some other species will prevail. This, I think, has often been erroneously attributed to the inability or indisposition of the soil to reproduce the former prevailing timber. I have observed much on this subject, and I never could see any important difference in the ability or disposition of the soil to nourish any of the different kinds of native trees, and also no important difference in the success in planting and starting them.

My observations convince me that it all, or mainly, lies in the favorable condition of the ground to receive the seeds of the various species of timber when it happens to fall thereon. A sycamore in the Wabash region will grow as large and rapidly on the uplands, where they are seldom found, as in the sandy bottoms along the margins of the streams, where they seem to best thrive. A white oak when planted will grow as well in the low river bottoms, where they are never or seldom found, as on the hills and ridges near by, where they seem to be the spontaneous product of the ground.

But if an acorn should be blown from a white oak on the hills into the low bottoms beneath, it would fall on ground very unfavorable to the sprouting of such acorns, and it would rot where it fell. So, on the other hand, if a sycamore ball (which contains one thousand to two thousand seeds) should, in the spring time, be blown to pieces after the winter's freeze, and the needle-like seeds be blown upon the adjacent hills, very few of them would light on ground favorable to sprouting them. Occasionally we find a lone sycamore on the uplands, standing among the oak, beech, poplar, and other upland timber, and every year bearing its quota of seed and shedding them on the adjacent ground by the million, none, or very few of which ever take effect, and for reasons before hinted at, but which will be more fully explained further on.

The sycamore seed must fall on ground warm, very moist, but not absolutely wet, and sufficiently bare for the sun to shine on it the greater part of the day. Otherwise it may not sprout. The acorn, on the other hand, falls a little while before the leaves fall. If it falls on very moist ground, it rots. If it falls on the leaves of the former year, and is shaded enough to prevent drying or baking from the sun, and is covered lightly by the fall of the current year's leaves, or by a chance wind has the old leaves drifted on top of it, a slow rain with subsequent sunshine will sprout it. It will send out little rootlets, which bore through the underlying old leaves and penetrate the ground, and once started, no weather or climatic conditions will kill it. The same is true of the seed of the hickory, beech, sugar maple, and other upland trees.

During the past two years my work has been on and about the Wabash River banks and its bottoms (flood plains), and I have discovered why it is that in some parts of these bottoms one kind of timber, as sycamore, will take complete possession of a few acres, while at or near by the cottonwood will prevail almost to the exclusion of everything else, and at other places the soft or water maple will do likewise, and still at another the water elm will monopolize all the space on which a grown tree can stand for several acres.

It comes about in this way: The balls of the sycamore, after undergoing the winter's freeze, are dissolved so that the separate needle-like or more properly pin-like seeds (as the outer end has the germ of the root, and swells into a bulb like a pin head) are blown by the wind, the little "fuzz" they hold enabling them to float a great way both in wind and on water. They begin falling early in the spring months, and if a flood is receding at the time, they stick to the soft, moist banks wherever they touch them, and particularly along the highest part of the sand bars. Were it not for the subsequent floods the same spring, there could no other trees grow, as the sycamore, being the first to shed, would seed all the tree-growing space (each large tree bearing one hundred and fifty million seeds), and their broad leaves would shade the ground till nothing else could sprout. But during their early infancy they are easily killed by an overflow, and this ill fortune happens to the greater portion of them.

The cottonwood is the next in order of shedding seed. If another flood is receding while the cottonwood is shedding, this flood will have killed all the sycamores, which it covered for only a few days, and will sprout all the cottonwood seed that may fall on and along the banks and bars. As the earlier floods are generally the highest, there will be some sycamores not reached by the following floods, and they will hold sway along that margin. If, when the cottonwoods are a few inches high, another flood follows, they too will be killed to the extent that they are kept under water for a few days.

Next to the cottonwood the soft, or bottom, maple sheds its seed. If a flood is receding, this seed will occupy all the space, as, having a smaller leaf than the sycamore or cottonwood, they will grow closer together. They in turn may be killed by a flood when they are very young.

I have forgotten the exact time that each of these trees sheds its seed; something will of course depend on the forwardness of the spring. But along the Wabash banks, last spring, I could see three belts of young trees, and distinguish them by their general appearance. The farther off, the plainer these belts show, till lost to view. The upper belt was sycamore, the second (downward) cottonwood, and the third soft maple. In June following there came a bigger flood than any that caused the seeds to sprout, and killed all of them. There was a bigger flood in the preceding February, but no seed fell then.

It will sometimes happen that the flood that plants the sycamores will be the last one for that year, and when they have lived through one summer they are safe from any danger from overflow. In still other seasons it will happen to favor the cottonwood, or the maple, or elm, or willow. New bars are all the time extending from the lower ends of the old ones; and as the elevation of these will be such as to be sometimes flooded once and not again for that year, the trees that shed their seed with the flood that barely covers such bars will plant them to overflowing fullness of their kind, and once they are secure from other floods they live out their time of two hundred to three hundred years.

The upper surface of the interior of the bottoms (back from the rivers) is built up by sedimentation, and when built above the height of the average floods, the burr oak, black walnut, buckeye, pawpaw, and bottom hickory make their appearance. Such sycamores, cottonwoods, and maples as live long enough to be relegated to the interior (as very few of them do) by the bottoms building riverward away from them, do not and cannot reproduce themselves, as the conditions that sprout their seeds have moved away from them. They die at the end of three hundred years at most, and leave no heirs to the soil.

How do the occasional lone, stray sycamore and cottonwood find their way to the uplands? I can see how in one case it was not only possible, but very probable. Five miles southeast of where I am now writing (Rockville, Indiana) is a pasture of hill land, so fenced as to include a section of a small stream at the foot of a hill facing north. There stand several half-grown sycamores which bear and shed their seed in this corner watering place. There these seeds are sprouted. There the cattle and horses resort for water. Every thimbleful of mud that may stick to their hoofs is liable to contain from one to five half-sprouted seeds, which are carried up the hillside and on the upland, as the cattle and horses return to their grass, and drop where the sun takes up the unfinished work of growing the tree. The result is that on every square rod of ground near this watering place stand one to five sycamores, varying in age from one to ten years, and they diminish in number as the distance from the watering place increases. It has been used as a pasture about ten years. I remember when it contained no sycamore at all. Just outside of the pasture fence, to the eastward, the land has never been fenced. The cows may drink where they please, and there are no sycamores scattered over the adjacent hills. If any seeds are thus carried there, the forest leaves and shade prevent their sprouting and growing. But along the little sand and gravel bars of the stream they sprout as thick as grass, only to be killed by the floods from the early summer showers.

From this I infer that two hundred to three hundred years ago the deer, elk, and buffalo, in their many wanderings across streams and over hills, have occasionally carried in their hoofs partly sprouted seeds, and dropped them on the hills where the sunshine was unobstructed, and the trees thus got their footing, and once getting it were able to stand afterward. These are the only kinds of trees I have observed, but I presume a similar law governs the distribution and self-planting of them all.

* By John T. Campbell, in the *American Naturalist*.

APPARATUS FOR CLEANING OILS.

The apparatus herewith illustrated is particularly designed for cleaning oil which has been used upon machinery and in the processes of manufacturing. The upper tank has an opening in the upper side protected by a strainer, and is for the purpose of receiving and storing the oil to be cleaned. It is placed on a suitable frame above the filtering tank, in order that the oil will be forced through the filters by hydrostatic pressure. The lower tank is formed with a central cylinder, to each end of which is connected a larger cylindrical chamber. The central cylinder or tube is inclosed in a steam jacket; and into each end is inserted a removable perforated tube. The filter consists of a rod extending lengthwise through the lower tank, and wrapped with woolen batting or felt between perforated disks, to form a roll of the same diameter as the disks; between the layers of wool are thin layers of wood sawdust. The four disks are of the same diameter as the tube, and are placed, one at each end and one just with the end of each of the removable tubes. Between the outer disks, at each end, wool alone is used. The upper tank is connected by a pipe, with the annular chamber in one end of the lower tank. Each annular chamber is provided with a waste pipe, and the steam jacket has pipes for the passage of steam.

The oil flows from the upper tank into the annular chamber, where any water which is present collects with the coarse dirt below the perforated tube, and is drawn off through the waste pipe. While in this chamber the oil becomes warmed and more fluid, and passes through the perforations in the tube and the filtering material to the opposite annular chamber, being further heated and liquefied in its passage. In this chamber any impurity or water which may have passed the filter collects in the lower part, and is drawn off through the waste pipe, while the cleaned oil is drawn off through a faucet (not shown in the cut) at the side. When it becomes foul, the filtering material can be removed and easily cleaned. To cause the oil to flow freely, the second chamber is connected with an open pipe extending above the upper tank; steam may be sent through this pipe for the purpose of cleaning the chamber.

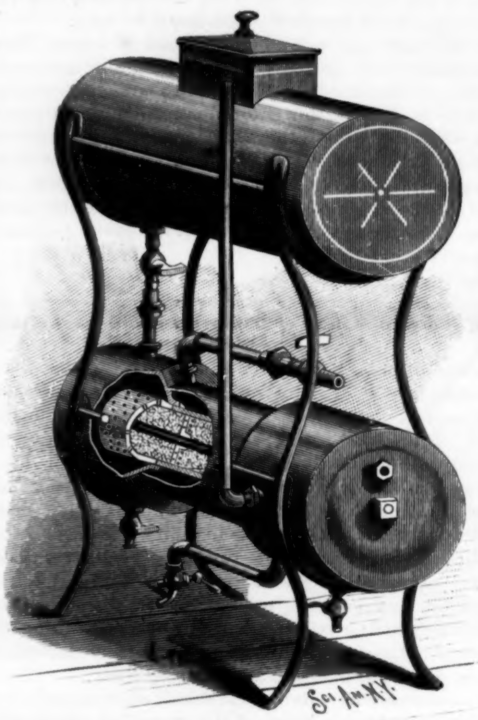
In actual service this cleaner has resulted in a saving of over 50 per cent in the oil used, and the same oil has been passed through it as many as sixty times, and each time being perfectly cleaned. The patentee, Mr. John C. Thornton, P. O. box 302, Mount Vernon, Ind., who will furnish further particulars, has received many letters strongly commending the cleaner.

A PORTABLE PHOTOGRAPHIC CAMERA.

The wonderful impetus which has been given to the practice of photography in consequence of the introduction of the modern sensitive gelatine dry plate, and the increased attraction it offers to all who wish to undertake it, by reason of the simplification of the different processes, is evidence that it will, in time, become very popular, and afford useful and profitable amusement to many.

So easily are the sensitive plates worked that any person of ordinary intelligence may obtain, after a few lessons, excellent pictures. The absence of the old-fashioned nitrate of silver bath, which formerly was the most troublesome article, for the amateur, connected with photography, now simplifies the manipulation very materially, and enables one to readily produce one or more negatives without the danger of soiling the fingers.

Ladies, in view of this advantage, are taking up the practice of photography to a very large extent as a pastime, and by the artistic talent which is so generally inherent in their nature often produce results which few adepts in the art can obtain.



THORNTON'S APPARATUS FOR CLEANING OILS.

It frequently happens, when a long journey is to be undertaken, that a portable camera, small and light, which will not be burdensome, is desirable, and of advantage in permitting the traveler to catch views, as he goes along, of whatever may attract his attention; and it was with a view to provide such an instrument that the apparatus we illustrate in our engravings was invented. If the nature of the article is concealed, so as to appear like something other than a camera, it enables the operator to take a picture without attracting the suspicion of the object photographed, and in consequence lifelike attitudes may oftentimes be easily caught and reproduced. Such instruments have been commonly named "detective cameras."

It will be our purpose to enter into a brief description of the Parsell camera, invented and recently patented by Mr. H. V. Parsell and Mr. H. V. Parsell, Jr., of this city. The primary object of the invention has been to condense the requirements of a camera into as compact a space as possible, and then to conceal its form by incasing it in a small leather covered rectangular box, provided on the outside with a neat leather handle and lock, as plainly indicated in Fig. 6, where it is intended to resemble a lady's reticule, or a case such as physicians frequently carry.

The essential features of the invention are the use of a lens of fixed focus, a peculiar snap shutter working within the lens tube, and released by a delicate trigger or pneumatic device, a miniature supplementary lens in connection with a balanced pivoted mirror for reflecting its image upward against a ground glass, arranged above the main lens, to act as a finder, and a receptacle for holding the extra plates.

Fig. 1 shows a longitudinal section and Fig. 2 a cross section of the box, near the front or lens tube end. The box is made in two parts, the upper portion forming a cover hinged on one side to the lower part. Near the front end of the top of the cover is a small square aperture (see Fig. 3), made directly over the ground glass screen, G, of the finder, and when the box is not in use this aperture is closed by a small metal slide.

Below the ground glass, G, of the finder is seen a pivoted balanced mirror, F, which reflects the reduced image from the small lens upward against the ground glass. The shaft which supports the mirror has a spring projection at right angles, which by slight friction bears against the exterior side of the metal finder box. This construction enables the operator to readily alter the angle of the mirror when it is desired to point the camera upward or downward.

It will be noticed the small lens is located directly over the main or view lens.

A pivoted diamond-shaped leather slide or door covers the main and finder lenses when the camera is not in use, and a similar false fixed leather slide is secured on the outside of the box at the opposite end. The main lens tube is fitted with lenses of the ordinary wide angle type, and is connected and supported at its rear by a conical metal chamber, which is secured to a wood partition provided with a rectangular aperture made to correspond with the size of the sensitive plate that is used.

Located midway between the lenses is a thin metal shutter, B, of peculiar shape (see Fig. 2, a view of the box looking from the rear to the front), which operates through a slot in the tube cut half way through it; the shutter rotates on a pivot supported by a small lug screwed to the outside of the tube. Near the edge of the shutter, in the lens tube, may be seen by the dotted lines a small rectangular aperture, which passes directly in front of the diaphragm of the lens when an exposure is made. Behind the shutter is pivoted an adjustable diaphragm plate, D, which is common to all wide angle lenses, and is used when time exposures are made.

Upon the face of the shutter, B, near the projecting edge next to the interior side of the camera box, are two small metal pins, arranged one above the other in such a manner as to allow the releasing trigger, C, to detain or hold the shutter at a proper point for making a "time" or an "instantaneous" exposure. If the shutter is pushed down until the upper pin comes under the narrow foot of the trigger, it will when released make an instantaneous exposure, as the aperture in the shutter will pass entirely by the diaphragm of the lens. If the lower pin is brought under the trigger, C, the aperture in the shutter will be brought opposite the center of the lens, and a time exposure may be made.

The shutter, B, is operated by a flat steel spring, A, having a slot in its upper end by which it can be passed over the screw peg and retained in position by a thumb

PARSELL'S PORTABLE PHOTOGRAPHIC CAMERA AND TRIPOD.

screw nut, which also increases or decreases the tension. From the screw peg the spring, A, passes over a triangular lug (see Fig. 2), and connects at its lower end to a metal link, which is also connected to the shutter, as shown. Motion is imparted to the shutter by the pushing action of the spring, through the link.

The trigger, C, is held in proper position by a light spring, and may be operated by a button spring, shown at one of the outside corners of the cover of the box, made to resemble all of the other fixed buttons, or by a pneumatic piston, the cylinder and pipe, E, of which may be seen attached to the interior of the front of the box, just below the upper portion of the trigger (see Fig. 2), and connected by means of a simple coupling at the lower side of the box with a short length of tubing and a rubber bulb. This latter arrangement forms a very convenient method of operating the trigger, as by concealing the pipe under the coat the exposure may be made without attracting attention. The outside pipe may be readily detached from the box, and attached to a shutter for time exposures, affixed temporarily to the outside of the lens tube, when desired.

At the rear of the conical metal lens box is placed the ordinary double plate holder, which is secured in position by two upright flat brass springs (see Fig. 1). Behind this are five other plate holders, which completely fill the box. Metal cells are arranged in this space to keep each plate holder in an upright position.

A metal plate is inlaid in the bottom of the box, provided with a screw thread, which allows the box to be supported on a tripod, as shown in Fig. 4, when used for making time exposures.

In taking a picture with the apparatus as shown in Fig. 3, the cover to the lens is first pushed to one side, the cover of the box is then opened, the shutter, B, (Fig. 2) pushed down until the upper pin is caught under the trigger, C. The slide of the plate holder is next withdrawn and the cover closed; the operator, holding the box in the left hand against the person, looks down upon the ground glass of the finder, and the moment the image appears thereon in the right position, presses with the index finger of the right hand the spring button on the corner of the box, thereby releasing the shutter and making an instantaneous exposure; the cover of the camera is then opened, the slide inserted in the holder, and a fresh plate brought into position.

An important advantage of the form of shutter adopted, is the small size and its rapidity of operation. The lens is arranged at such a focus that objects a few feet or at a great distance will be equally sharp; the size of picture is 2⅛ inches square, and may readily be enlarged. The weight of the camera when loaded with six plate holders is only 2¾ pounds.

The tripod, shown spread out in Fig. 4, is made of wood in the form of a large cane as shown, when closed up, in Fig. 7, and it is divided equally into three triangular sections, the shape of which is plainly seen in the lower end of the section in Fig. 5. The upper end of each triangular section is made hollow, and is bound with metal, to receive the sliding metal legs which support the head of the tripod. A hollow headed milled screw passes through the metal band on each section and secures the metal leg or rod at any height, similar to the usual plan of adjusting sliding tripod legs.

Fig. 5 shows a larger view of the construction of the head of the tripod; the screw at the top of the head fits into the screw plate at the bottom of the camera; the head itself is free to revolve in any direction on the spindle in the plate to which the tripod metal legs are attached, but may be secured in any position by a set screw shown at one side under the head; this allows the camera to be readily turned and secured in any desired position after the tripod is once leveled.

A thin metal cap having the form of the head of a cane, and provided with bayonet slots at the bottom, fits over and conceals the head of the tripod as shown. A similar cap also protects the bottom spurs of the tripod legs; the two caps thus convert the tripod into a cane, as shown in Fig. 7.

Equipped with a light portable camera and a convenient tripod such as we have described, the amateur photographer can, with considerable comfort, travel about unnoticed, and easily obtain instantaneous views and pretty bits of scenery. What has sometimes been considered as laborious work is thus converted into pleasure, and without realizing it many interesting events and scenes are recorded in such a way as to be of much value and usefulness in after years.

Further information regarding the apparatus can be had from Wm. T. Gregg, No. 318 Broadway, New York city, N. Y., who has also the exclusive control of the invention for the United States.

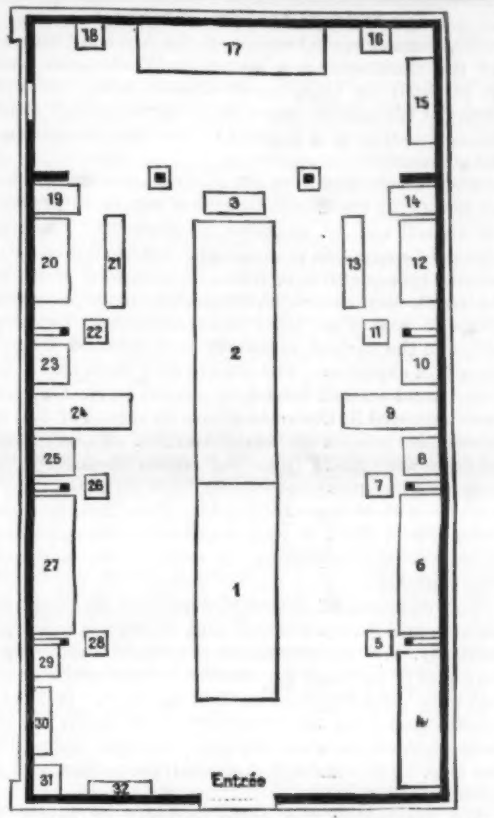


Fig. 1.—PLAN OF GALLERY OF PALEONTOLOGY PARIS MUSEUM

THE NEW PALEONTOLOGICAL GALLERY OF THE PARIS MUSEUM.

The collections of fossils of the Paris Museum of Natural History have hitherto never been brought together in a special gallery, for the very simple reason that paleontology is, so to speak, a new science in France, and one whose autonomy was not recognized until 1853, the epoch of the erection of the chair of paleontology, which was first occupied by A. D'Orbigny.

The existence of paleontology was not foreseen at the time of the organization of the Museum by the National Convention. About a century ago fossils were considered as petrifactions appertaining to mineralogy. Cuvier, through his admirable researches on fossil bones, laid the foundations of our science, but he studied these objects from the standpoint of comparative anatomy. Later on, Blainville created the word *paleontology*, and from the day that this science had a name its progress and its popularity have never ceased to manifest themselves. It may be said, then, that paleontology is doubly French in its origin.

Nevertheless, the fossils remained distributed between the different chairs of the Museum. The vertebrates were in charge of the professor of comparative anatomy, and the invertebrates in charge of the professors of geology, malacology, and entomology. The founding of a chair of paleontology in 1853 did not improve this situation much, since the appointee had charge of no public collection. But in 1879 a considerable change supervened, for it was then decided by the Minister of Public Instruction that the fossil vertebrates should be placed under the direction of the professor of paleontology, Mr. A. Gaudry, who was naturally designed for such a position through his splendid work on the extinct faunas.

This learned professor, seconded by Mr. Fremy, the Director of the Museum, then formed a plan to bring together in one gallery those fossils which were most remarkable, and which could not be placed in glass cases on account of their large size. These interesting specimens were scattered through the galleries of comparative anatomy and geology, and the laboratories, where they were scarcely accessible to the public

This new gallery was organized in a few months, and was opened on the 17th of March, 1885. When we enter the new hall, we find ourselves in the presence, first, of two enormous skeletons—that of the *Megatherium cuvieri* (No.

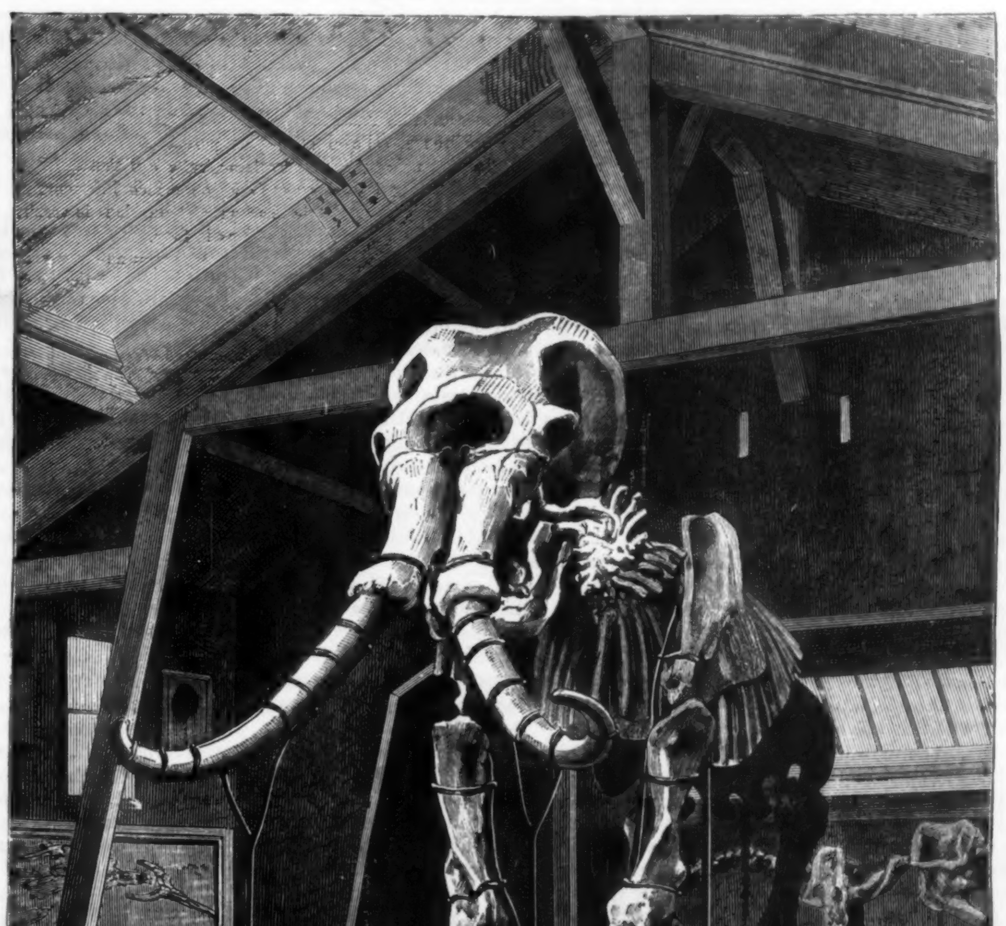


Fig. 2.—SKELETON OF THE DURFORT ELEPHANT.

1 of the plan) and that of the *Elephas meridionalis*, or the Durfort elephant, so called from the place where found (No. 2 of the plan). The skeletons occupy the center of the gallery. Behind the elephant are three calcareous slabs mounted like a triptych, and derived from the Eocene of Monte Bolca (No. 3). These show the impressions of fishes and leaves, admirably preserved.

Upon passing along the walls from right to left, we find in succession: The *Dinornises*, gigantic birds of New Zealand (No. 4); the *Glyptodon typus* (No. 6), invested with its powerful carapax; the *Cervus megaceros* (No. 9), surrounded by four magnificent tortoises, the largest of which came from Madagascar (Nos. 7, 8, 10, and 11); the *Acerotherium gannatense*, or Gannat rhinoceros (No. 12), surmounted by a viviparous *Ichthyosaurus;* a beautiful *Crocodilus rateli* (No. 14); the limbs of the *Helladotherium duvernoyi* (No. 14), recalling those of the giraffes; and, finally, an *Ursus spelæus* (No. 15), or cave bear, which appears very small amid the colossuses that overlook it.

The end of the hall is occupied by a nearly complete skeleton of the *Mastodon angustidens* of Sansan (No. 17), placed between two heads of *Elephas insignis* (No. 16) and *Mastodon humboldti* (No. 18.) Continuing toward the left, the visitor will remark in succession:

The *Pelagosaurus typus* (No. 21), a small crocodilian whose bones and carapax are isolated; two carapaces of edentates from South America; *Glyptodon typus* (No. 20); *Hoplophorus ornatus* (No. 23); the doe of the Iceland *Cervus megaceros* (No. 24); the hind quarters of an enormous edentate, reaching the stature of the *Megatheria;* the *Lestodon armatus* (No. 25); the skeleton of *Glyptodon typus* (No. 27); an immense slab in which is preserved the skeleton of a *Palæotherium magnum* (No. 30); and, finally, portions of the head of *Dinotherium giganteum* (No. 29) and of *Mastodon angustidens* (No. 31).

In addition to these large specimens, a few others of less dimensions are mounted in front of the columns of the gallery—such as the long bones of large mammals, elephants, mastodons, and dinotheriums (Nos. 5, 22, 26, 28). Above, against the walls and near the windows, are placed slabs of *Mystriosaurus* and *Ichthyosaurus* and of various fishes, and skulls of *Bos primigenius*, *Bison priscus*, *Bubalus antiquus*, *Rhinoceros tichorhinus*, *Cervus megaceros*, etc. Such is the general arrangement of the gallery. We shall now say a few words about the most interesting fossils.

The Durfort elephant (Fig. 2) is the most important specimen in the gallery. Its skeleton measures more than four yards in height. The discovery of this fossil is due to Messrs. Cazalis de Fondouce and Ollier de Marichard. Upon passing near Durfort, these gentlemen perceived the extremity of its tusks just reaching the surface. They began excavating, and found that the entire skeleton was buried *in situ*, the bones being arranged according to their natural connections. Realizing the importance of their find, these zealous naturalists communicated with the professor of comparative anatomy of the Museum, Paul Gervais, who obtained the funds necessary for disinterring the skeleton. The digging was done from 1873 to 1875, and the extraction of the bones presented great difficulties on account of their extreme friability. The skillful moulder of the Museum, Mr. Stahl, had to consolidate them in place with spermaceti before disengaging them from the matrix. Thanks to this process, the elephant was carried without accident to Paris, where it was mounted under the directions of Gervais and Senechal.

The *Elephas meridionalis* is more ancient in Europe than the mammoth, or *Elephas primigenius*. Its chin is more prominent, its tusks are less curved, and its molars are remarkable for the distance apart of their blades and the thickness of their enamel. It is supposed that its skin was not woolly like that of the mammoth. At Durfort it had hippopotami and a few other animals of warm climates as contemporaries, while the mammoth lived in company with the thick-furred *Rhinoceros tichorhinus* and *Cervus tarandus*, which were accustomed to low temperatures. The Durfort elephant was not lying down, but was in an upright position, its head up and its tusks raised, as if it had been buried in a marsh while alive. The remains of many other animals were found in the same bed—fishes, fresh water shells, etc.—*La Nature.*

A New Hæmostatic.

At a recent meeting of the Academy of Medicine, at Paris, Professor Bonafoux read a paper upon a powder which possesses great hæmostatic powers, and is capable, it is said, of arresting the bleeding of large arteries, so that it will prove serviceable in important surgical operations. This powder is composed of equal parts of colophony, carbon, and gum arabic. Experiments have been tried with it on the brachial artery in man, and on the smaller vessels, on the carotid of the horse, and other blood vessels of the same animal, with marked success. It has always prevented consecutive hæmorrhage. The application can be lifted in the course of two or three days, when the vessels are found to be completely obliterated.

National Academy of Sciences.

The regular spring session of the Academy was held at the Smithsonian Institution, Washington, April 21-24, with an attendance of over thirty members. Many of the papers read were highly technical. Among those which were of popular interest the following may be mentioned:

Surgeon-General J. S. Billings detailed the methods of measuring the cubic capacity of crania, as practiced by himself and Dr. Mathews, his assistant. The application of composite photography (Galton's method) to obtain type-pictures of different groups of skulls had at length been successful, by employing proper precautions to secure accuracy of adjustment and superposition of the various negatives and the most desirable length of exposure. The camera and stand and patent lever stand were all leveled by a spirit level. The skulls were adjusted in the craniophore by means of two fine black lines intersecting at right angles. The composite pictures were made from the crania themselves, and not, as in Galton's experiments, from pictures. The results were much more satisfactory than those from pictures. From six to sixteen skulls were thus combined in each composite picture. A series of the composites was exhibited.

The duration of exposure depended on many conditions, and it required skill and experience to gauge it correctly. Where many skulls were to be combined, the exposure of each one was shorter than where there were but few. The dry plate method was used. It is not to be expected that the type-pictures of skulls will give race distinctions with the same clearness with which faces do. The standard of one-half the natural size was recommended.

For measuring the cubic capacity of skulls, Dr. Mathews devised the scheme—using water instead of solid particles. The laws which regulate the fall of solid particles are not well understood, whereas the sciences of hydrostatics and hydrodynamics are well settled and generally known. Earlier schemes for using water as a measure had been very expensive, and not perfectly accurate. The use of wax to render skulls waterproof had been expensive, and the causes of error are the water wetting the skulls and the glasses into which it is poured, making a difference in the measurement. Dr. Mathews uses fresh putty instead of wax, used by Topinard. First wash out the crania—a precaution never to be neglected; then let them dry thoroughly, which requires some weeks. They should be kept till the weight is no more than it was before washing.

Then spray the interior of the skull with shellac varnish, using 10 cubic centimeters, which will leave, when dry, a bulk of 1 cubic centimeter. Three minutes suffices for this process. Then the skull must be allowed to dry, which will not take over twenty-four hours. Then cover any breaks with India rubber and adhesive plaster, and fill the orbits and carotid canal with putty, and cover the base of the skull with the same. Place the skull face down, and cover with a sheet of putty. By observing precautions indicated in filling skulls with water, and in measuring the water, 2 cubic centimeters should be the maximum of variation, in place of 5 on the old system. This method requires more time than others, but it gives the advantage of eliminating the personal equation of the operator, and of securing results which are of universal comparability, whereas those of Broca's method can only be compared when used by persons trained in his laboratory.

The very technical papers on winged insects, by S. H. Scudder, and on some forms of extinct crustacea (Syncaridæ and Anthracaridæ), by A. S. Packard, gave rise to an interesting discussion. Professor Cope remarked that science has developed as a generalization what he had observed in vertebrates, viz., the correspondence of past with present orders. Certain characteristics of later times are acquired before others disappear, and sometimes minor characteristics are the most persistent. Professor Gill thought that Scudder's paper militates against the view formerly held of the relative ranks of metabola and heterometabola. The earliest insect life did not develop from a caterpillar. Insects were evolved from a form intermediate between arachnids and crustacea. Professor Cope replied that the evolution of the caterpillar was due to degeneracy in certain portions of life, during which insects become caterpillars. Professor Gill stated that synthetic types were a stumbling block to the taxonomist. These insects and crustaceans break down the barriers between species as they now exist. In paleontological forms we find united in the same individual characteristics which now mark differences between species and even orders.

Prof. Riley rose to speak, but was ruled out of order. He afterward stated privately the criticism he would have made, namely, that paleontologists in many cases unduly exalt trivial distinctions, as in one of Packard's papers, where the length of the fore legs was used as a specific characteristic. No naturalist would so regard it in classifying extant types.

T. Sterry Hunt read a paper on Classification of Natural Silicates. The bulk of the earth's crust is composed of silicates. The former classification, based solely on sensible characters, was not satisfactory; neither is it sufficient to rely only on chemical constitution. Both must be considered. There is, however, a consonance between them. With increase in density due to chemical constitution comes increase in hardness and in resistance to chemical action. There are three groups of silicates:

1. The protoxide bases. 2. The proto-, per-, or sesquioxides, of which alumina is the most important. 3. The peroxides. This is a genetic system; it has relation to the order of time in which the formations appeared. This system may be extended to the non-oxides, and it paves the way to a truly natural system in mineralogical, as much so as in biological science, the absence of which is the reason that mineralogy has been comparatively neglected. Prof. Remsen remarked that the classification of the carbon compounds foreshadowed these results. The main difficulty is to get the conditions of classification when temperature and pressure differ entirely from ordinary. We must look for results in the direction of synthesis; but as yet we have very little knowledge of the fundamental compounds from which others are derived.

Gen. Comstock's paper on the Ratio of the Meter to the Yard showed that the determination of this ratio in 1880, which was then considered accurate within one micron (millionth part) of probable error, was too small by the 1-120,000 part, and the corrected value of the meter is now stated as = 39·3699 inches.

Prof. Elias Loomis' paper On the Cause of the Progressive Movement of Areas of Low Pressure explained the general drift of storm centers toward the east, sometimes in opposition to the course of surface winds, as due to the prevalence of pressure from the west. In middle latitudes east winds are exceptional, and, even during the prevalence of east wind, the causes that produce west wind are only temporarily suspended. Much of the air on the east side of a storm center rises from the earth's surface, but on the west side it does not rise at all. Hence the storm moves in the direction of least resistance, viz., eastward.

The paper on the Submarine Geology of the Approaches to New York, by J. E. Hilgard and A. Lindenkohl, enumerated three noteworthy features:

1. The submarine valley continuing the course of the Hudson River for about eighty miles in a direction 60° E. of S.

2. Shallow water, extending for one hundred miles south from New York and Long Island, and fringed by a steep declivity.

3. Terminal moraines, extending from northwestern New Jersey in a southeasterly direction far out to sea.

Major J. W. Powell's paper on the Organization of the Tribe was in effect an elaborate homily on the text with which he set out, that "in the light of new material collected throughout the world, a new significance is attached to the kinship of tribes."

He set out with a theoretical tribe of primitive simplicity, wherein all the men call each other brother; all the women are sisters; the children call all men father and all women mother. Admitting that no such society had ever been discovered, he claimed to draw a legitimate inference from some languages which contain words for these direct relationships, but none for indirect relations. He traced increasing complexity of relationships and the two kinds of descent: the paternal, called by Romans agnate, and the national, which is more usual among savages, and for which he proposes the term enati. He then traced the development of the clan, the chief characteristics of which are kinship, either enatic or agnatic, exogamy, and feud protection. Tribes may be fissiparous, and each tribe into which the original divides may have segments of each clan, or only of part of the clans. In Australia clanship presents several peculiarities nowhere else seen.

Prof. Cope read a paper on the Pretertiary Vertebrata of Brazil. He stated that the Tertiary vertebrata of South and Central America belongs to one fauna and to one geological horizon, the Pliocene. The most important fossil of the Peruvian beds is a reptile of primitive form, the *Stereosternum tineidum*, which differs from any previously known genus of the Peruvian beds. It had the ribs fixed immovably to the vertebral lobes, hence was incapable of intercostal breathing.

The discovery of this type was interesting to those who adopt the theory, much exploited of late, of the distinct origin of life at north and at south poles; and it certainly did not at all discredit this theory.

Prof. Rowland gave the value of the ohm as corrected by his own experiments as equal to 106·2 centimeters of mercury one millimeter square.

Prof. A. Graham Bell read papers on the Measurement of Hearing Power and on the Possibility of obtaining Echoes from Ships and Icebergs in a Fog.

Prof. Edward S. Holden, Director Washburn Observatory, Madison, Wis.; Prof. Henry Mitchell, U. S. Coast Survey; Prof. F. W. Putnam, Cambridge, Mass.; Prof. W. A. Rogers, Harvard Observatory, Cambridge; and Dr. Arnold Hague, U. S. Geological Survey, were elected members.

WM. H. HALE.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. John A. Craig, of Lauderdale, Miss. Combined with the drawhead is a peculiarly operating bail-shaped rod link lifter, which is designed to so work that ordinary pin and link couplings may be coupled automatically.

An oscillating engine has been patented by Mr. Charles P. Waldron, of New York city. This invention consists of a new link movement for operating the slide valve of oscillating steam engines, and also of improved means for discharging water from the cylinder of the engine, making an engine which is very convenient and easy to attend, while the link mechanism will not readily get out of order.

A method of casting car wheels has been patented by Mr. William Wilmington, of Toledo, Ohio. This invention relates to an improvement upon a method of casting car wheels formerly patented by the same inventor, its object being to regulate and facilitate the melting of rich ferromanganese before entering the mould, and to incorporate its elements in varying quantities in different parts of the car wheel, particularly those parts forming the tread and flange parts.

A steam boiler has been patented by Mr. Samuel P. Hedges, of Greenport, N. Y. This invention is to improve the construction provided for in a former patented invention of the same inventor, to prevent steam from carrying water with it into the steam pipe, and consists in combining centrally perforated and concaved plates with the upright cylinder, its outwardly projecting tubes, etc., so the ascending water and steam will be separated, and dry superheated steam delivered to the steam pipe.

MECHANICAL INVENTIONS.

A metal punch has been patented by Mr. Gilbert McDonald, of Augusta, Kan. It consists principally of a wedge having cogs or teeth formed upon its edges interposed between the power and the plunger which carries the punching or cutting tool, being more especially designed for tinners and blacksmiths, for punching or cutting plates of metal, hot or cold.

AGRICULTURAL INVENTIONS.

A plow gauge has been patented by Mr. James B. Law, of Darlington, S. C. This invention covers a novel construction by means of which the shoe may be raised or lowered at its rear end, while the forward end remains fixed, so the depth of plowing may be regulated, and the pitch of the plowshare may be directed to throw the earth more or less from the furrow.

A corn planter has been patented by Messrs. Albert Thurstin and Frederick Jacoby, of O'Fallon, Mo. This invention covers a special construction and combination of parts and details, with reference to the row marker, hill markers, driver's seat, seed box, slide gate, and other novel features, in a machine to plant corn in accurate check rows.

A corn planter has been patented by Mr. Albert J. Wood, of Wilder, Kan. This invention covers novel details of construction whereby the seed dropping slide may be operated from the drive wheel, and the mechanism can be readily thrown into and out of gear, making a machine which insures accuracy in planting corn and other seeds in hills.

A potato planter has been patented by Messrs. Alva J. Agee and Alex Fraser, of Cheshire, O. The box for carrying the potatoes to be planted is mounted on a suitable sulky frame, and has a chute, gate, and dropping tube, the attendant regulating the discharge of potatoes from the chute so that only one potato will rest on the gate at a time; covering hoes follow, so constructed as to regulate the quantity of earth covering the potatoes.

A corn husking machine has been patented by Messrs. John Johnston and Burnet B. Stewart, of Algonquin, Ill. It is intended to husk corn which has been cut and shocked, and provides mechanism to pull the ear from the stalks as they are fed to the machine, to brush the husks back toward and over the butts of the ears, to sever the butts and husks from the ears, and to discharge the stalks, husks, and husked corn ears separately, the several mechanisms acting successively and for the most part automatically, so as to do a large amount of work with little labor of attendants.

MISCELLANEOUS INVENTIONS.

A pump driver has been patented by Mr. John W. Runyan, of Catawba, Ohio. This invention relates to a class of devices used for storing and transmitting power, and has for its object to provide means whereby an old style clockwork and weight may be utilized to work a pump.

A pencil or crayon holder has been patented by Mr. Max Rubin, of Philadelphia, Pa. This invention provides a specially contrived case, of simple construction, but so made that the lead, when loose, cannot escape or project from the case, and so the lead cannot be made to project further than a fixed distance.

A horse power for hay carriers has been patented by Mr. John S. Grabill, of Hayesville, Ohio. The object of this invention is to improve the construction of horse powers under a former patented invention of the same inventor, that they shall be lighter, stronger, and more convenient for use.

A dumping scow has been patented by Mr. John Dunn, of Jacksonville, Fla. This invention combines with a scow a tilting deck or decks, with special details of construction and combinations of other parts, to facilitate the dumping of a load from a scow, either altogether or in separate parts or quantities.

A portable laboratory for dentists and jewelers has been patented by Mr. Noah W. Caughy, of Baltimore, Md. It is in the nature of a secretary bureau, to be closed for compactness and to contain the machinery, tools, and materials generally used by dentists and jewelers, with the laboratory necessary for use therewith.

A tilting chair has been patented by Mr. Adam Demand, of Sheboygan Falls, Wis. This invention covers devices whereby the tension of the springs which resist the tilting back of the chair is regulated by a yoke piece, so the seat leveling springs may be adapted to a nicety for the chair to be comfortably tilted back by heavier or lighter persons.

A button hole cutter has been patented by Mr. Max Kamak, of New York city. The object of this invention is to facilitate the adjustment of the device according to the desired length of the cut, there being, on a button hole cutter, a sliding key between the legs at the joint, which key can be adjusted for cuts of different lengths.

The manufacture of hydraulic cement forms the subject of a patent issued to Mr. Robert Bryce, of Louisville, Ky. The process consists in grinding together limestone and Leitchfield marl or shale in certain proportions, using a limited amount of moisture, compressing into bricks, and burning and grinding the bricks.

A road or tramway for vehicles has been patented by Mr. Moses A. Martindale, of Elkhart, Ind. Combined with trough-shaped rails and connecting gauge bars are plates to enable taking a deep hold on the ground, with various novel features of plan and construction to make an efficient tramway over common wagon roads.

An apple paring and slicing machine has been patented by Mr. William T. Elliott, of Meredith, N. H. This invention covers a special construction and arrangement of parts for a machine to be run either by hand or power, one which will be very rapid in its action, as well as practical, durable, and effective in its action.

A furnace for manufacturing illuminating gas has been patented by Mr. Frederic Egner, of St. Louis, Mo. This invention covers an improvement in the class of gas furnaces whose gas exit pipe is located but a short distance above an air inlet, and connected with an exhauster for the purpose of drawing off the gas and also creating a vacuum in the furnace.

A paper wreath has been patented by Mr. Charles Kaufmann, of New York city. It is made of a circular piece of paper, cardboard, etc., having its edges cut or punched out, as the contours of a wreath of natural leaves, and having its face printed in colors, in imitation of natural leaves, on which circular piece separate leaves are held at their stem ends.

A food steamer has been patented by Mr. Le Roy S. Bunker, of Valton, Wis. This invention provides for the use of a round boiler more strong and durable than those usually employed, and the boiler can be lifted off from the base, or when in place may be held by clamps, affording an improved means for cooking food for farm stock.

A feed cooking apparatus has been patented by Mr. Joseph J. Cox, of Lawrence, Kansas. It is a steaming and boiling apparatus, a long boiler being combined with a furnace having separate chambers under the center of the boiler, and separate flues for the chambers extending to opposite ends of the boiler, so a small furnace may be used, with great economy of fuel.

A machine for removing ice and snow has been patented by Mr. Jacob F. Riethmayer, of Lansdale, Pa. It is adapted to be moved by hand, for removing snow and ice from sidewalks and pavements, etc., and is so operated that its plow may be set at either side, according to the direction in which the snow is to be thrown off, and has a scraper with teeth for breaking or loosening up ice or hardened snow.

A lantern has been patented by Mr. Luther B. Wood, of Omaha, Neb. It is designed to burn lard oil or other heavy oil, where means are employed for warming the oil in the reservoir of the lantern, and is contrived to make the lantern heat its own oil, and in such way that the temperature of the oil may be regulated by turning the tubes a greater or less distance from the flame.

A churning device has been patented by Messrs. Sylvanus B. Wood, Hervey Wood, and Thomas W. Wiley, of Callisburg, Texas. According to this invention, the cream can is closed and locked in position in a peculiarly constructed frame, so that it rests in a frame which may be rocked by a spring bar by a person standing at the side, so the contents of the can will be thoroughly agitated.

A brick truck has been patented by Mr. Daniel J. C. Arnold, of New London, Ohio. The invention consists in a pallet truck with two or more shelves or series of racks arranged one above the other over the wheel axle or springs, and disposed and constructed so that the load may be readily balanced, being especially adapted for carrying bricks as they are dumped from the moulds on the pallets.

A window screen holder has been patented by Mr. Henry C. Barlow, of Dallas, Tex. Wires are secured on the casing of the window frame with bends near their upper ends, and hook eyes are held on the sides of the screen frame and surrounding the wires, making an improved device for a sliding window screen so the screen may be held in front of the upper or lower sash, as desired.

A roller shelf book case has been patented by Mr. Walter N. Conant, of Toledo, Ohio. This invention covers a peculiar construction and arrangement of parts, so that the books, while being put into and removed from the case, will not come into contact with anything but rollers, and will thus be prevented from being rubbed or marred by coming in contact with the stationary parts of the case.

A washing machine has been patented by Mr. Samuel L. Wagener, of Nepean, Carlton County, Ontario, Canada. This invention relates to machines in which a convex-shaped vibrating rubber, with bars on its acting surface, works within a fixed concave, also having bars for rubbing and working the clothes, but covers a novel construction and arrangement of the bars on the vibrating rubber and in the concave.

A fastening for bag, pocketbook or purse frames has been patented by Mr. Louis B. Prahar, of Brooklyn, N. Y. It is made with a case having two latches held in place by two springs, and a plate and rod engaging with the inner ends of the latches, so the fastening can be unlocked from the ends or center, the whole device being simple in construction and operation and inexpensive to manufacture.

A brush for flour bolting machines has been patented by Mr. Jonathan B. Richards, of Pettigrew Mills, Ark. This invention provides such a construction that the brushes can be easily adjusted to suit a reel of any size, of which they will brush the entire surface, and they can be fixed to drop more or less, thus preventing the brushes from exerting an undue pressure on the reel.

A heater frame for lamps and gas burners has been patented by Mr. Alfred M. Rickerby, of Brooklyn, N. Y. The device consists of two tripods with tubular posts, one tripod to fit snugly in the collar of a lamp, and another to fit a gas burner, the outer ends of the arms having projections to receive the posts, the frame being very inexpensive, and capable of being taken apart and packed snugly.

A fire ladder has been patented by Mr. Constantin Lazarevitch, of Brooklyn, N. Y. The invention consists principally of a folding brace or support attached to the ladder and truck arranged for bracing the ladder directly from the ground when the sections of the ladder are elevated for use, the sections of the ladder also having permanent water pipes for adapting it when elevated to be used as a water tower.

A sod ground pulverizer has been patented by Mr. Abijah L. Gordon, of Helix, Oregon. It is made with a frame having a shaft carrying two cylinders with tapered and scalloped digging flanges, so the sods will be cut and torn in pieces without being turned or raised from their places, the construction being such that the cylinder bearings can be readily oiled, and dust and soil will be excluded.

An explosive weight for torpedoes has been patented by Mr. James E. Gallagher, of Olean, N. Y. The object is to insure the explosion of torpedoes placed in oil wells, the weight to be dropped after the torpedo having also, by this invention, a cartridge and fuse, so the weight can be fired, and in case it misses striking the torpedo, the latter will be exploded by the explosion of the cartridge.

A tricycle has been patented by Mr. Carl G. E. Hennig, of Paterson, N. J. This invention relates to a former patented invention of the same inventor, and consists principally in the addition of other treadles applied to the crank axles, so attached that they act at the dead center of the axle; also in the construction of the fifth wheel, and the employment of pivoted seats that accommodate themselves to the rider.

A filter has been patented by Mr. David Biggs, of Castleton Corners, N. Y. It is a vessel divided into two compartments by a vertical partition, each compartment having a filtering medium and a separate outlet cock, and the vessel having an inlet pipe with a three-way cock by which water can be admitted into either compartment, making a filter simple in construction, which can be cleaned easily, and can readily be connected with the water pipe.

A bag holder and lifter has been patented by Mr. John A. Hamsch, of Traverse City, Mich. The apparatus comprises a step-like platform arranged to move up and down uprights or guides by means of a rope and windlass operated by suitable gears, an upright ratchet rack, and a peculiar click controlled from the platform for locking it when raised, or at any desired point, and bag-holding devices connected with the frame of the apparatus.

A bucket or receptacle for malt liquors has been patented by Mr. Saxo W. A. Wiegell, of New York city. The top is provided with one large and several small openings, with a movable cover to close them, so the bucket may be filled through the large opening, and the cover closed, that the strength of the liquor cannot escape, the contents being drawn off through the small holes without materially exposing the liquor to the air.

A cider and wine press has been patented by Messrs. David G. Higinson, of Spring Valley, N. Y., and Cornelius S. De Baun, of Westwood, N. J. It has spring pressed rollers, endless belts, and guide rollers, and a hopper-shaped spout, with special details of construction, so that the juice will be expressed from the pomace as it comes from the grater in a continuous operation, and all handling of the pomace will be avoided.

A grain measuring apparatus has been patented by Messrs. Omar P. Wagner and Oscar E. Wagner, of Pontiac, Ill. With a vessel having a removable bottom is a revolving vessel with gates hinged on its bottom, a cam for operating the movable bottom of the fixed vessel, and a rod connected with the gates on the bottom of the revolving vessel, and with the cam shaft, etc., making an improved apparatus for automatically measuring grain or other cereals.

An anti-friction bearing has been patented by Mr. John Flannery, of New York city. Combined with the shaft, journal box, and a collar on the shaft are disks, on which anti-friction rollers are mounted, arranged between the collar and the ends of the box, thus reducing the friction of propeller shafts in their bearings and at the same time permitting the bearing to be drawn up tight, so that there will be little or no lost motion lengthwise, and the friction will not be increased.

A fiber rubbing machine has been patented by Mr. Alexander Scott, of Cronly, N. C. This invention consists in combinations of spirally or transversely fluted rollers, through which the fibrous material is passed as the rollers are revolved, and jets of water are delivered, the water being then pressed out by suitable wringer rollers, and the material picked or carded, the machine being especially adapted for rendering the fiber of pine needles useful for upholstery purposes or for spinning.

A perforated glass plate for making medicinal tablets has been patented by Mr. John E. Schreck, of New York city. The object of this invention is to provide a plate which shall not be affected by the acids or quicksilver contained in the medicinal ingredients of the tablets, guide pins being made to force the finished tablets out of the holes. A mould for making the plates has also been patented by the same inventor, in which the lower die has perforations and the upper die a follower, so the plates can be readily cast and removed from the mould.

A fork prong rolling machine has been patented by Mr. Philippe D. Dupont, of Summerville, Vt. It comprises a combination of specially grooved half rolls and a frame, on the outside of which the rolls work, with a recess or space for certain of the prongs while the other prongs are being rolled, the machine being especially adapted for rolling or drawing the prongs of agricultural forks, half round prongs, such as used in potato diggers, etc. The same inventor has also patented a machine for pointing or sharpening the prong ends of forks, including spade forks, potato diggers, and other agricultural implements, the machine having duplicate sets of peculiarly constructed and operating radial hammers or dies, with special details, so the pointing or sharpening may be done with great celerity and precision.

NEW BOOKS AND PUBLICATIONS.

THE CIVIL ENGINEER'S POCKET BOOK. By John C. Trautwine. Revised, corrected, and enlarged by John C. Trautwine, Jr. John Wiley & Sons, New York. Price $5.

Since its first edition in 1871, "Trautwine's Pocket Book" has attained wide popularity among engineers, this issue making the twenty-second thousand which has been published. The writer disclaimed at the outset the idea of publishing a work for the information of "experts," but put forth his book for the benefit of young members of the profession, leaving out the following of problems into the higher mathematics, and endeavoring to be as practical in treatment and simple in statement as so comprehensive a work would allow. In the revised edition this principle has not been departed from, but the contents have been rearranged, some of the articles rewritten, and large additions have been made, the book now consisting of nearly 900 pages, on mensuration, trigonometry, surveying, hydraulics, hydrostatics, instruments and their adjustments, strength of materials, masonry, bridges and culverts, dams, railroads, earthwork, etc.

HOW TO DRAIN A HOUSE. Practical information for householders. By George E. Waring. Henry Holt & Co., New York. Price $1.25.

This is the last of several works by the same author on a branch of sanitary engineering in which he has come to be considered an acknowledged authority. Good plumbing, the best materials, and simplicity of detail, as far as possible, are here insisted on, and have always been the guiding considerations recommended by the author.

WATCH AND CLOCK MAKING. By David Glasgow. Cassell & Co., New York. Price $2.

This is an excellent addition to the series of Manuals of Technology already published by the same house. It is designed as a book of reference for the practical workman, and also as a text book for technical classes, giving a history of the development of different improvements, and the requisite information to judge of their value.

PRAIRIE EXPERIENCES IN HANDLING CATTLE AND SHEEP. By Major W. Shepherd. O. Judd Company, New York.

This book contains the experiences of an English army officer on a summer's visit to the United States, together with his comments thereon. He does not keep very closely to his subject, but rather gives us his ideas on this and a host of other topics, much as one would be likely to do while simply enjoying a summer holiday, making a book which probably many will read in a good deal the same way.

THE AMERICAN BOY'S HANDY BOOK. WHAT TO DO AND HOW TO DO IT. By D. C. Beard. New York: Charles Scribner's Sons, 1882.

The title of this quite prettily gotten up book leads us to expect a great deal from its contents, for we agree with Master Randolph Miller, Miss Daisy's brother, that "American boys are the *best* boys," and we naturally expect their books to be the *best* books. Mr. Beard has the boys' welfare much at heart in writing his book, and while a little more completeness would have added much to its value, it will prove a prize to an active, ingenious lad, blessed with some constructive talent. The fanciful division into seasons has been more of a disadvantage, we think, than a gain. There are many distinctively summer and winter sports which would be treated very appropriately under those heads; but to carry the division further is to sacrifice more in arrangement than is gained by the distinctions. Thus the subject of fishing finds place in three different parts of the book; but since the most juvenile disciple of Izaak Walton will understand that the fish must come before he can be caught, an exhaustion of the subject under one chapter would seem more convenient, and as a reference book make it more "handy." The spirit of the book, however, is very praiseworthy, for all its devices are clearly and pleasantly described, and have the great merit of being eminently attainable. Short articles, covering a portion of its contents, appeared in *St. Nicholas*, and the favor with which they were received has already given the book a hearty reception.

THE INTERNATIONAL NAUTICAL MAGAZINE for April is the initial number of a publication whose particular mission is announced to be the enlightenment of seafaring men in regard to current events in both the marine and political world. If so commendable a purpose is realized, the magazine will make itself welcome in many a cabin, and, we would like to add, forecastle, but unfortunately Jack Tar is not much given to reading. The contents of the first number are fairly interesting, and the reader, perhaps now at the antipodes, will find in them a ready means for bringing his information up to date.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) S. M.—For the city of New York, where Croton water is used in boilers, all that is needed to keep them in condition is thorough cleaning every 3 months. For hard water incrustation, you will find very full instructions in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 137, 286, 375, and 444.

(2) M. H. writes: What would be the rate of speed of water forced through a 10 inch main from a 15 inch cylinder, having a piston speed of 100 feet per minute, and what should pressure gauge vary? When the water leaves the cylinder, it is forced for about 1½ miles through a 12 inch main, then the main contracts to 10 inches, and continues about ¾ mile to reservoir; under 260 feet head our gauge at pump shows variation of 10 lb.; on main near junction of 10 and 12 inches, 20 lb. Can you explain the cause of different variations in different parts of the main, and why does not gauge at pump vary as much as elsewhere? A. The water in the 10 inch main will have a speed of 225 feet per minute. No pump runs so even that an air chamber can be dispensed with, especially upon so long a line of pipe. The pump stroke produces the variation in the gauge near the pump, which becomes cumulative near the junction of the 12 inch and 10 inch pipes. A large air chamber near the pump may relieve you of a source of danger to the pipes. Although your pump may be running nicely, your gauges show that the water is not flowing evenly in the pipes.

(3) G. P. writes: We want some plan to prevent the noise or work of our lodge room (I. O. O. F.) from being heard in the room below; we have a good floor and carpet, good partitions, walls plastered, etc., but are willing to go to quite an expense to remedy the present defect on this score. A. Probably you have no deafening under the floor. In such case, there only two ways that we can suggest for your trouble: To take up the floor and put in a plaster deafening between the seams. Next, to take up the carpet and lay 2 thicknesses of roof felting or paper boards (bookbinders' boards might do, or paper carpet lining). Then lay battens across the floor, and a new floor on the battens. Do not nail the battens to the old floor. Then lay the carpet lining, and the carpet on the lining.

(4) G. & S. ask: 1. What is the best method of cleansing water in a large tank before pumping into the boiler, to prevent sediment or crust forming therein? An engineer told us that he had used concentrated lye successfully for more than a year, using only sufficient lye to clear the water of lime. We use clear, hard well water. A. Concentrated lye, or caustic soda, is probably as good as anything that can be named for preventing incrustation in boilers, where hard water is used. If convenient, a little tannic acid may be added from time to time. This may be obtained by soaking oak bark in water. A pound of caustic soda and 2 quarts of oak bark decoction per week is probably enough for a forty horse boiler. Blow out once a day, and clean the boiler by opening the hand and man holes; wash and scrape out all scale and sediment once a month. 2. Will the lye in such quantity as stated, injure the boiler? A. The lye will not harm the boiler. The only harm is in not blowing out and cleaning often. 3. We have a feed grinder, the hardened steel step of which will heat when the burrs become a little worn, so that the pressure must be increased; the manufacturers advised us to put sulphur in tallow and use it instead of oil, and we have had as much trouble as before. Clear tallow does as well as anything we have used. The shaft runs at 1,000 revolutions in a babbitted box, which keeps nice and clean, but the steel step at the end makes all the trouble; and although there is an oil groove in the step, the pressure seems to be too great to allow the oil to do its duty. Please advise as to our best course. A. It is possible that the groove in the step is not deep enough or not sufficient to fully lubricate the bearing surface. Cut a second groove, and make both deeper than their width. Use good oil. Cold pressed sweet lard oil has been proved the best lubricator under heavy pressure. If the trouble is not overcome in this way, try a steel washer under the foot; it will divide the friction by doubling the surface. In this case both step and spindle should be grooved.

(5) N. W. C. desires a receipt for taking ink out of linen. A. Dip the part in boiling water, and rub it with crystals of oxalic acid; then soak in a weak solution of chloride of lime—say 1 ounce to the quart of water. Under any circumstances, as soon as the stain is removed, the linen should be thoroughly rinsed in several waters. 2. How to make a hektograph or gelatin pad? A. Take:

Good ordinary glue	100 parts.
Glycerine	50 "
Barium sulphate finely powdered (or the same amount of kaolin)	25 "
Water	375 "

First dissolve the glue in water, heat it, add then the glycerine. Use aniline ink.

(6) W. E. B. asks: 1. What is the best mode for the recovery of gold from jewelers' sweeps? If by fire, what is the best way to construct the furnace, and what the best flux? Also, what modes are practiced by sweep smelters, etc.? A. Sweeps are first ignited, in order to burn up all carbonaceous and to drive off all volatile constituents. The sweeps are then ground and mixed with litharge and sand, and reduced to lead bullion, which is then treated in the ordinary way by cupellation or zinc desilverization. The process is not one adapted to the ordinary jeweler's convenience, and it is best to send the sweeps after ignition directly to the refiner. You will find "The Goldsmith's Handbook," by George E. Gee, an excellent guide for manipulations in gold, etc.

(7) G. W. H. asks for the method of etching on copper and zinc, both in relief and otherwise. Also the method of printing. A. The copper plate is first covered with a ground of equal parts asphaltum, Burgundy pitch, and beeswax, and then etched out with solutions of nitric acid varying in strength. A special variety of printing press is necessary to the printing. A description of the process is given in Spons' Workshop Receipts, 1st series.

(8) H. W. G. asks the best way to take care of a flute. A. The great desirability in the proper care of musical instruments is their preservation at a uniform degree of temperature—not too moist, for that will tend to corrode and affect the metallic parts of the instrument; nor too warm, for an elevated degree of heat will warp and ultimately crack the wood. The intermediate effects naturally influence the tone of the flute, therefore it is desirable to preserve it in a box or bag.

(9) B. N. N. asks whether wood can be coated with India rubber. If so, how? A. A solution of rubber in carbon disulphide may be used to coat wood with. The liquid will evaporate off, leaving a film of rubber behind. 2. How to clarify or refine a barrel of the oil that is made from coal tar, known as "dead oil," and used by roofers to some extent? A. Try the following: Place in a close vessel 100 pounds of the crude coal oil, 25 quarts of water, 1 pound chloride of lime, 1 pound soda, and ½ pound manganese dioxide. The mixture is violently agitated, and allowed to rest for twenty-four hours. When the clear oil is decanted and distilled, mix the 100 pounds coal with 25 pounds resin oil; this is one of the principal points in the manipulation; it removes the gummy parts from the oil, and renders them inodorous.

(10) M. C. asks for a good receipt for staining violin. A. Stain with 1 quart alcohol, 3 ounces Brazil wood, ½ ounce dragon's blood, ½ ounce cochineal, 1 ounce saffron. Steep to full strength, and strain. 2. Also a good varnish. A. For varnish, rectified spirits of wine ½ gallon, add 6 ounces gum sandarac, 3 ounces gum mastic, and ½ ounce turpentine varnish; put the foregoing in a tin can by the stove, frequently shaking till well dissolved; strain, and keep for use. If you find this too hard, thin with more turpentine varnish.

(11) T. P. H. asks: How can I make canvas for a tent mildew and water proof? A. Three baths are prepared, the first by dissolving 1 part neutral aluminum sulphate in 10 parts cold water. For the second boil 1 part light resin, 1 part soda crystals, and 10 parts water till the soda is dissolved; add ½ part common salt, to separate the water and collect the soap; dissolve this soap with an equal amount of good palm oil soap in 30 parts water. This soap bath must be used hot. The third bath consists of water only. Soak the fabric thoroughly in the first or alum bath; next pass it through the soap bath, and lastly rinse in the water. Boiled linseed oil is sometimes used to render canvas waterproof. Paint the tent with it, using a brush.

(12) J. S. asks: 1. What is the silver soap (so-called for cleaning show cases, metals, and polished woods) made of, and what proportions? A. The following are among the many preparations used: Mix ¼ pound jeweler's rouge with ¾ pound prepared chalk. Or, ½ pound levigated putty powder, ½ pound burnt hartshorn, 1 pound prepared chalk, and 1 ounce rose pink. Or, ½ pound fine chalk, 3 ounces pipe clay, 2 ounces white lead, ¾ ounce magnesia (carbonate), and the same quantity of jeweler's rouge. 2. Is the silver plating fluid made of one ounce of nitrate of silver, one ounce of cyanuret of potash, dissolved in water, injurious if used on teaspoons, knives, and forks? A. The solution is poisonous of itself, but as deposited on various articles, no injurious effects follow. The potassium cyanide is the poisonous ingredient, and not the silver.

(13) J. A. T. asks for a description of the process of lithographing, the preparing of the stone and method of printing, etc. A. There are two methods of lithography in general use. In the one a drawing is made on the stone with a lithographic crayon or with lithographic ink; in the other method the design is made on lithographic paper, which, on being moistened and passed through the press, leaves its design on the surface of the stone reversed. In either method, water acidulated with nitrous acid, oil of vitriol, or hydrochloric acid is poured over the stone, and this, by removing the alkali from the chalk or ink, leaves the design on it in a permanent form, at the same time that it etches away a portion of the lights, and renders the surface more absorbent of water. The process of printing is as follows: Water is passed over the stone, the roller charged with printing ink is passed over the surface, the paper is applied, and copy is obtained by the action of the lithographic press. The same process must be had recourse to for each copy. The nature of the stone is such that it retains with great tenacity the resinous and oily substances contained in the ink or crayon employed to form the design, and also to absorb the water freely; this, combined with the peculiar affinity between resinous and oily substances and their mutual power of repelling water, occasions the ink on the printing roller to adhere to the design and to leave untouched the lights. The stones are prepared for lithography by polishing in the ordinary way; the style of work for which they are intended determining the degree of labor bestowed on them. For crayon drawing the surface should have a fine grain, but the finish of the stone must depend upon the desired softness of the intended drawing; for writing or drawing on in ink the surface must receive a higher polish, and must be finished off with pumicestone and water.

(14) J. L.—Lava tips wherever made are not accurate in the measure of gas burned, only as near as the mechanical method of manufacture will allow. They are nearly correct at ¾ inch water pressure.

(15) E. M. asks: What material is used to mix with graphite, to hold it in compact form, for the manufacture of lead pencils, etc.? A. Pure clay in varying quantities, to regulate the hardness of the pencils, is ground with the graphite, the mixture is pressed through small holes or in dies to form the pencil lead, then baked in closed muffles.

(16) V. T. writes: I find that scraps of zinc put in a stove fire will consume the soot and effectually clean out the stovepipe and flue. Would the same treatment of a tubular fire box boiler result in any injury to the boiler? A. We would not recommend a trial of this plan.

(17) W. E. F.—The method of making phosphorated Babbitt metal is only known to those that make it. Try placing in the bottom of a crucible a little pulverized bone and the Babbitt on top. Melt and stir. A few experiments will no doubt meet your requirements.

(18) W. L. B.—There have been published processes for hardening cast iron, principally by sprinkling the surface with cyanide of potassium and hardening from a low heat in water.

(19) W. C. P.—We know of no better way to harden leather for soles or stiffenings of shoes than by thorough tanning and on the lapstone. The best material to stick together leather board and stiffenings is an especial Para cement made for this purpose, but it is altogether better not to use any leather board.

(20) W. S. A. asks: What metal or mineral substance, a ball of which placed in a steam boiler will render it less liable to incrustations? A. Zinc.

(21) W. B. asks for a formula for a paste which will well and firmly stick labels on tin cans for packing and exportation. A. Try either of the following: Soften good glue in water, then boil it with strong vinegar, and thicken the liquid during boiling with fine wheat flour, so that a paste results. Or, starch paste with which a little Venice turpentine oil has been incorporated while it was warm. Or use a dilute solution of gelatin or of isinglass.

(22) W. B.—The Guibal (French) and the Schiele fan ventilators for mines have been largely introduced in English mines within the last thirty years. Previous to that, and as far back as the beginning of the century, various blowers and other devices for mechanical ventilation, more or less faulty, had been used in various places, but without entire success.

(23) J. B.—Leather belting is made by cutting out the leather lengthwise of the hide and passing the strips through an evener, which skives off sufficient from the fleshy side to make it uniform in thickness. Then the pieces are put in a stretching machine for a time, again trimmed straight and to the proper width, ends scarfed, glued, and riveted.

(24) R. I. F. and P. H. W. write: Take three wedges of equal dimensions, except one is cut off half way from edge to back. Place the two whole ones on their backs, their faces close together at the bottom, of course diverging upward; fill this space with the wedge that is cut off; consider all surfaces smooth and well lubricated, including horizontal plane on which wedges rest; apply pressure to back of center wedge—now, what will be resultant strains? What per cent will be conveyed in vertical stress on horizontal plane? A. The horizontal stress on the wedges at bottom will be, in parts of the vertical pressure, 1·732. The vertical strain upon the plane is equal to the vertical pressure.

(25) J. W. K. writes: I have a profile of Abraham Lincoln, cast in brass, that I would like to give a smooth bronzed appearance to. Can you inform me by what process I can do it? A. If your casting is rough, you can smooth it only by filing and chiseling. Then possibly a bronze lacquer would serve your purpose, one kind of which you may make by dissolving ¾ pound of shellac and ½ pound sandarac in 3 quarts alcohol, adding enough extract dragon's blood and turmeric to produce the desired color.

(26) R. J. P. writes: Would you suggest any alteration in the following proportion for a small steam launch? Length of keel 18 feet, beam 4 feet 6 inches, depth in center 24 inches, fitted with a vertical engine, cylinder 2½ inches by 3 inches, ports 2¼ inches by ¼ inch, exhaust 2¼ inches by ½ inch, lap on valve ⅛ inch. Vertical boiler with about 35 feet heating surface, carrying 120 to 130 pounds pressure. What speed ought I to get with it in smooth water? Should it be clinker built? If not, how? A. The clinker build is too light and frail for a steamboat. We cannot improve on your proportions. With a well proportioned wheel you may make 7 miles per hour.

(27) H. E. D.—There is an armor oil sold by gunsmiths, that will keep cutlery in good condition. The following is said to keep polished ironwork bright: Common resin melted with a little gallipoli oil and spirits of turpentine has been found to answer very well. The proportions should be such as to form a coating which will adhere firmly, not chip off, and yet admit of being detached by continued scratching.

(28) A. H. asks: 1. By what means do experts determine how long ink has been written on paper, and is it possible to determine this with any degree of accuracy? A. Older writings are more difficult to remove from paper than those recently written. Experience has so much to do with this subject that it is very difficult in brief space to give a definite idea. 2. How do inks in general (especially mauve or aniline inks) affect the texture of paper? Can this effect be detected with a microscope? A. Inks differ principally in consideration of their ingredients, and, therefore, they are distinguished by their behavior with reagents. 3. When chlorine gas or hypochlorous acid is used for removing inks, it gives to the paper acted upon a yellowish cast. By what process can the paper be restored to its original appearance and whiteness? By what means is the polish restored, and what menstruum is best to wash the paper with after chlorine or hypochlorous acid has been used as the bleaching agent? A. A little gum water will frequently restore the appearance of the paper, but an expert can almost always distinguish the erasure. 4. Supposing I have removed a blot of ink from a sheet of white paper *with a liquid*. This liquid will remove the gloss of the paper in this particular spot only. Now, how can this spot be restored so that it will have the same gloss, evenness, and appearance of the rest of the paper? A. A little colorless size or gum water, with perhaps a little alum, has been used, but it is practically impossible to restore the condition of the paper so that an expert cannot detect the erasure.

(29) F. B. asks in regard to papier mache floor covering: 1. Will it hurt to use printed paper? A. According to the article "A Papier Mache Floor Covering," we find Manila paper recommended. It is very likely that newspaper would answer, but it is by no means as strong an article as the variety spoken of. 2. How thick will that covering be? A. The thickness depends upon whether more than a single thickness of the paper is used—probably from one-sixteenth to one-eighth of an inch in thickness. 3. How long will it be before it is ready for use? A. That depends entirely upon the drying; if artificial heat is applied, we should think that the whole operation could be carried through and the covering finished within a week.

(30) J. X. D. asks a receipt for making or mixing the colors used in printing cretonnes or upholstery goods, and how to apply them to the cloth. A. The designs on upholstery goods are either woven into a suitable pattern by using colored threads previously dyed, or else the designs are printed into the material by what is called roller printing. In the latter case too complicated processes are necessary to be described in this department.

(31) C. C. S. writes: 1. What is the cheapest and best way for a young man to become a machinist? A. Connect yourself with some shop where the trade can be learned. 2. What is a trade union? A. An organization of workmen for their mutual protection. They agree as to what prices shall be received, and compel their members to give their work up rather than receive a lower amount of pay, etc. 3. What is the best way to make cheap transmitters for a short line telephone? A. A simple transmitter has been made by placing two common nails across each other on a wooden plate, and attaching a pattern wire to each of the nails. Then, having the battery and telephone in circuit, talk on to the wood. In SCIENTIFIC AMERICAN SUPPLEMENT, No. 383, you will find Munro's transmitter described. See also "How to Make a Working Telephone," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 142. 4. If I heat a gun barrel red hot, will the bore of the gun become larger or smaller than it was when cold? A. The bore will expand as the barrel becomes heated.

(32) L. E. H. writes: Can you tell of any way by which the ink used with rubber stamps can be made to resist moisture? Varnishing causes the ink to spread, and so does not answer the purpose. The objection to printing ink is that it destroys the rubber. A. The following ink is totally indelible. It consists of 16 parts of boiled linseed oil varnish, 6 parts of the finest lampblack, and 2 to 5 parts of iron perchloride. Diluted with ½ the quantity of boiled oil varnish, it can be used for a stamp. Of course it can only be used with rubber stamps, for the chlorine in the ink would injure metallic type.

(33) G. H. P. asks: 1. What can I do to soften spruce gum sufficiently for chewing? A. We would recommend you to remelt the gum, adding a little beeswax to the mixture. Lard, grease, and rosin are frequently added directly to the kettle during the first boiling. 2. How is gum done up in papers for the trade? A. When the mixture in the pot has become sufficiently thick, and is well stirred, it is rolled out in a sheet about one-quarter inch thick, and then chopped into pieces about one-half inch wide, three-quarters of an inch long. These pieces are wrapped in tissue paper and packed in wooden boxes.

(34) L. J. S. writes: We are using several large inspirators to feed our boilers, and we think they would work better if we were to place an oil cup on the steam supply pipe for inspirators; but as we use the steam from these boilers for heating our brewing water direct, we would like to know what oil to use that would not be detrimental to the water for said purposes, etc.? A. We fail to recognize any advantage to be derived by the use of an oil cup as suggested by you, but the best liquid to use would be glycerine.

(35) J. J. R. writes: What will soften the water in our well, and still leave it fit for drinking and cooking purposes? The water is very hard, and it is as much as we can do to wash with it. A. By adding lime to the water, and allowing the mixture to stand for 24 hours and then filtering, the condition of the water will be improved. See the article on "How to Soften Hard Water," SCIENTIFIC AMERICAN SUPPLEMENT, 270.

(36) A. W. asks for information regarding the "castor bean," its value, and mode of making oil ready for the market. A. See the article on "The Castor Bean Plant" in SCIENTIFIC AMERICAN SUPPLEMENT, No. 186. In a rough way the process is as follows: The seeds having been thoroughly cleansed from the dust and particles of the pod with which they are contaminated, are placed in an iron tank and heated to such a degree as will liquefy the oil without any risk of scorching. They are then pressed, the oil escaping being known as "first quality." The pressed seed is heaped up; on the following day it is again heated and pressed, and gives a "second quality" oil. Occasionally, too, the cake from the second pressing is treated with carbon disulphide, which extracts a small additional quantity of thick, dark, common oil. All qualities need purifying and clarifying. Castor oil is selling at 17 to 17¼ cents for barrels, and 17½ to 18 cents for cases.

(37) N. E. C. writes: 1. Will you please explain the nature of ventriloquism? Why is it an accomplishment attained by so few? A. Ventriloquism is accomplished by modifying the tones of the voice, and this is done by varying the position of the tongue and the soft palate, dilating or contracting the mouth or pharynx, and either dividing the buccal or pharyngeal cavity into several compartments or throwing them into one. 2. Has the ventricle great development in persons possessing that accomplishment, or is it due to constant practice? A. It has been demonstrated that the vocal organs of the ventriloquist are the same as those of other men, nor is his use of them materially different from that of others. It is therefore due to practice.

(38) S. M. writes: Can you give a formula for a brilliant waterproof finishing polish to be used on veneer after it is rubbed down with pumice stone and water? The polish to be applied the same as French polish. Use linseed oil 1¼ lb., amber 1 lb., litharge 5 oz., white lead, pulverized, 5 oz., minium 5 oz. Boil the linseed oil in an untinned copper vessel, and suspend in it the litharge and minium in a small bag, which must not touch the bottom of the vessel. Continue the boiling until the oil has acquired a deep brown color, then take out of the bag and put in a clove of garlic; this is to be repeated 7 or 8 times, the boiling being always continued. Before the amber is added to the oil it is to be mixed with 2 oz. linseed oil and melted over a fire that is well kept up. When the mass is fluid, it is to be boiled and stirred continually for 2 or 3 minutes; afterward filter the mixture, and preserve it in bottles tightly corked. When this varnish is used, the wood must be previously well polished and covered with a thin coat of soot and spirits of turpentine. When the coat is dry, some of the varnish may be applied, which should be equally distributed on every part with a small, fine sponge. This operation must be repeated four times, being always careful that each coat will be well dried first. After the last coat of varnish, the wood must be dried in an oven and afterward polished.

(39) R. R. S. writes: Can you suggest anything that will deodorize kerosene oil of 150 degrees fire test without injuring the quality of the oil for lighting purposes? A. Properly refined kerosene should only have a faint odor. Try the following: Chloride of lime is first introduced into the cask or other receptacle containing the oil, in the proportion of about 3 oz. of chloride to each gallon of liquid. In this manner chlorine gas is evolved in the oil or spirit. If necessary, the evolution of the gas may be assisted by pouring in hydrochloric acid and then agitating, so as to bring the whole of the liquid into intimate contact with the chlorine gas. The oil is then passed into another vessel containing slaked lime, which, having an affinity for the chlorine, absorbs the same.

(40) C. N. S. desires a recipe for a whitewash suitable for outbuildings on a farm; something that will not rub or wash off, and not injure trees and can be tinted. A. For one barrel of color wash use half a bushel white lime, three pecks hydraulic cement, ten pounds umber, ten pounds ocher, one pound Venetian red, one-quarter pound lampblack. Slake the lime, cut the lampblack with vinegar, and mix well together, then add the cement and fill the barrel with water. Let it stand twelve hours before using, and stir frequently while putting on. This wash is not a clear white, but a light stone color, which may be more or less changed by the other colors. This covers well, hardens without scaling, and will not wash off.

(41) M. N. B.—The copying property of inks is due principally to the addition of glycerine, sugar, or sometimes a little chloride of lime. But after taking this quality out by a series of impressions, we know of no way of restoring it.

(42) E. M. C. desires a recipe for cream candy. A. See the article on "Confectionery at Home," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 199.

(43) W. E. M. and F. X. M.—The following process will probably be the easiest for your working on stones and minerals: Take a piece of iron about 2 in. by 8 in., and ½ in. thick, and fasten it to a piece of wood so that the latter can be used as a handle. Then with sharp sand and water grind until a level surface free from hammer marks is obtained. The specimen to be polished is then bound in a frame of 6 in. smooth board just a trifle lower than the face, and the edges are filled with plaster of Paris. The grinding process is then continued with No. 60 emery until the surface is sufficiently smooth, then polished off with a little putty powder and felt. The felt can be nailed right over the rubber previously used. Minerals are generally broken by means of chisels and hammers, and then ground as previously described.

(44) C. D. T. writes for the best and most simple means for deodorizing mutton suet or tallow to be used in the manufacturing of pomades. A. Boil the tallow for ten minutes with about one-third its weight of water, each pint of water to contain a small quantity of common salt and a little powdered alum; strain the water off, and let the fat rest for some hours before using. Injecting steam is commonly used. Hydrogen peroxide would be likely to accomplish your object.

(45) H. W.—Distilled water obtained through a condenser of iron pipe and aerated is healthy, and often used on shipboard when short of other water supply. Lead pipe is not safe, as the distilled water absorbs lead. Tin lined lead pipe is safe and gives pure water. You can make an air condenser by using an unusually large amount of surface in iron or tin lined lead pipe, which saves the cost of pumping water for cooling the coil.

(46) G. C. B. writes: 1. What is the largest telescope in the world? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 485. 2. My son's hair is very red; do you know of anything to change its color, or at least to make it look darker? A. You can lighten the hair by using hydrogen peroxide, or darken it by using Nacquet's Bismuthic Hair Dye, described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 356. 3. What is aniline? A. The coloring substance prepared from coal tar. 4. Please to state what will thin my son's hair, as it is very thick? A. There is nothing that we can recommend for this purpose.

(47) J. R. M.—Patterns for bronze statuary are modeled in wax, clay, or plaster of Paris, from which sections are moulded and cast in zinc or type metal. These sections are finished and fitted together in convenient sections or whole parts for moulding in sand, the only material suitable in which to cast bronze or brass.

(48) W. H. W.—The black iron work for fireplaces is japanned. The Japan varnish after spreading upon the work is baked in an oven at 260°, and becomes very hard. There is no lacquer or varnish that you can air dry that will stand the heat for fireplace iron.

(49) Z. T. D. asks: How much water per second will flow through a 14 inch pipe, 80 feet long, with 8 feet head? Also, 18 inch and 21 inch pipes, same conditions? A. The discharge for 14 inch pipe, 18 cubic feet per second. For 18 inch pipe, 34 cubic feet per second. For 21 inch pipe, 50 cubic feet per second.

(50) D. F. S. writes: I have a brass clock spring 1 inch wide, and wish to cut a few pieces twelve inches long and straighten them. How can this be done? A. Draw the spring over a piece of wood, at the same time scratch the divisions with a divider. Then hold the spring so that it will not slip on the piece of wood with a rounded back, and with a fine saw saw along the scratched lines until the hard task is done.

(51) A. S. R.—A force of 180,000 pounds per square inch has been obtained when gunpowder was burned in a chamber only equal to its own volume. By dividing 180,000 by the proportion of the volume of the powder to the volume of your chamber, you may approximate to the pressure which may be obtained. Thus with a chamber a thousand times larger than the volume of the powder, you may have 180 pounds pressure.

(52) J. D. & Co. ask a process to prevent the smuts from escaping in the air from a lampblack house. A. Carry the outlet of your lampblack chamber to one side and into the top of a vertical shaft, where place a rose jet of water. Have the water drop vertically in an even spray, so as to produce a draught down the shaft. The water will gather the waste lampblack, which can be either utilized or run into the sewer. A vent at the bottom of the shaft may connect with a chimney or into the open air. A pump or city water supply will be required.

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